JANUARY, 1944

20,100 COPIES

TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

ON THE JOB!

OUR CATALOG IS OUR STOCK LIST

within

48 HOURS

After Your Cutting Tool Order Reaches the Putnam Factory

If you have a job for which you have immediate need of any one of hundreds of different end mills, Putnam can get the tool of the right type and size to you within 48 hours. In many cases, tools which you would ordinarily consider as "special" cutters are manufactured as standard and carried in stock.

Also immediately available from stock are complete lines of continuous pilot counterbores, spiral fluted chucking reamers and end mill holders.

• CUT F ER
• LA T LO ER

Spec Mills •
Counter-
• Spiral Fluted
Reamers

ARMY (E) NAVY

PUTNAM TOOL COMPANY

2985 CHARLEVOIX AVE. • DETROIT 7, MICH.

SPEED UP THE JOB

Conserve LABOR AND MATERIAL

Use FCC Air Hardening Tool Steel Cast-to-Shape for blanking, forming, drawing, swaging and embossing dies; also for bushings, cams, shears, rolls and similar tooling.

These Cast-to-Shape steels deliver the job to you already half done. With only 1/8" to be machined off, even on the most intricate shapes, your dies can be put into production more quickly and at greater saving.

Cast-to-Shape tool steels are produced in a variety of analyses offering unusual resistance to wear and abrasion. They are manufactured in electric furnaces under precision laboratory control.

Back the Attack with War Bonds

Prompt delivery
to your specifications

Write Today
For Booklet A

QUALITY FCC SERVICE

THE FORGING and CASTING CORPORATION

FERNDALE (DETROIT) MICHIGAN

HARDINGE

SPECIFICATIONS

1" collet capacity, 14" longitudinal, 13¼" vertical, 5½" transverse travel, eight speeds from 110 to 1850 R.P.M. TM model for plain milling, UM model for spiral milling.

HIGH SPEED PRECISION MILLING MACHINE

Precision tool room milling is profitable on this milling machine, designed to meet a definite need in the tool room and laboratory. The precision construction, along modern lines, combines ruggedness with extreme accuracy for ease of operation. Investment and time cost will indicate that larger milling machines are extremely expensive and awkward for many tool room and laboratory milling operations.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

The Collet that "Makes" Precision

Collapses 1/32 in. — Retains Gripping Strength and Accuracy.

Collet open at both ends.

PRINCIPLE

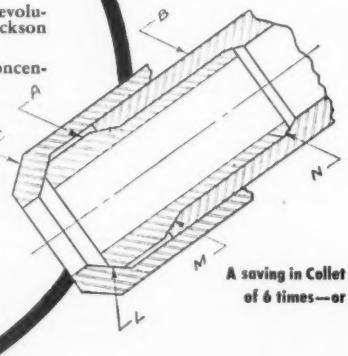
The drawing (right) illustrates the revolutionary principles embodied in the Erickson Precision Collet Chuck.

Collet "A" is automatically lined up concentrically with the axis of the Shank "B" by two Cam Surfaces of the Collet "M and N" mating with the Cam Surfaces of Shank. The Shank and Collet Cam Surfaces are mated to within .0001 inch.

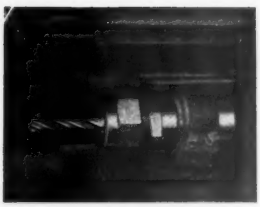
This action aligns Collet with the Axis at the Center of Shank, allowing it to be drawn back by Collet Cam Surface "L" and Nose Piece "C".

Due to the fact that collet is open slotted at both ends, Collet "A" then collapses equally throughout its length to maintain a vise-like grip and remain in perfect alignment with the Axis of Shank.

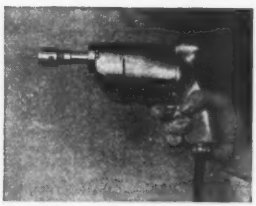
One ERICKSON COLLET will replace 7 standard, single purpose Collets.



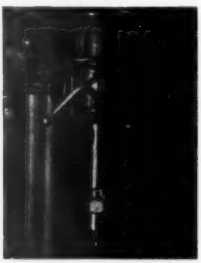
A saving in Collet expense of 6 times—or more.



Model 402 Chuck in use on Automatic Screw Machine. Drill gripped on flutes.



Special Model 202 Chuck used in Hand Drills in Aircraft Industry. 01 Models are regularly recommended for Hand and Air Drills.



Model 201 used in drill press. Extra long drills can be used, by extending them from the chuck as they wear.

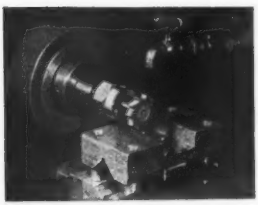
Send for Bulletin E giving complete information and additional photographs of uses

ERICKSON STEEL COMPANY

The ERICKSON COLLET CHUCK★★

Model "01" accurate within .0005 or less at the nose.

Models 102 and 402 Chucks in use on Automatic Screw Machine.

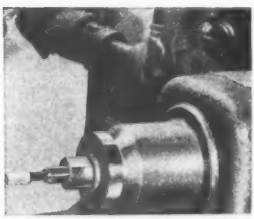


Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.

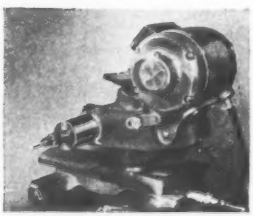
Model 102 Chucks for drilling and tapping operations on Turret Lathe. Jobbers Drill stubbed on chuck in foreground.

Model "02" accurate within .001 or less at the nose.

Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.



Model 301 Chuck designed for high speed internal grinding operations.



Tool Post Grinder equipped with Model 301 Chuck.

2309 Hamilton Ave., CLEVELAND 14, OHIO

ABRASIVE

No. 34 SURFACE GRINDER

8" x 24" 12" under wheel
Vertical Spindle

SPECIAL EQUIPMENT
(furnished at extra cost)

SPECIAL CORTLAND TYPE SEGMENTAL WHEEL CHUCK

In many cases . . .
Reduces wheel wear, improves finish, lessens tendency to overheat or "burn", increases production of small parts.

• • •

ROTARY GRINDING ATTACHMENT
(see inset)

On the Production Line . . . No. 34 grinds flat parts for automatic rifles, anti-aircraft guns and aircraft engines . . . also other flat surfaces of high precision.

In the Toolroom . . . Grinds small blanking and piercing dies, the feet or locating spots on jigs or fixtures, and other flat surfaces within capacity of machine.

No. 34 in limited numbers available for prompt delivery.

WRITE TODAY

ABRASIVE
ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL CO • EAST PROVIDENCE 14, R. I. • *Dealers in Principal Cities*

PLAN FOR TODAY AND TOMORROW

WITH (T-J) FOR

Tough Jobs!

● Men responsible for *efficient production* in all types of industrial plants for a quarter century... have found T-J products "tops" for Tough Jobs!

Whether it's a job for Rivitors...hydraulic cylinders ...air cylinders...cutters...Clinchors...or air controls... you can count on T-J for unbeatable efficiency, accuracy and dependable performance! All T-J products built to precise standards of manufacture...rigidly inspected... backed by practical-minded experienced engineering. In planning a better production set-up for better products...specify T-J Quality! Write for bulletins.

The Tomkins-Johnson Co., Jackson, Mich.

HYDRAULIC CYLINDERS

DIE SINKING MILLING CUTTERS

CLINCHORS

AIRCRAFT RIVITORS

AIR CYLINDERS

AIR CONTROLS

(T-J)

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

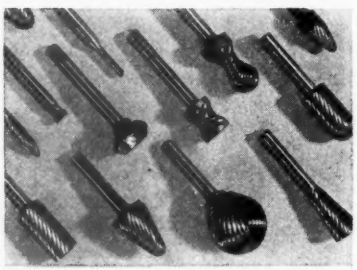
SEVERANCE DISC CUTTERS SPEED FINISHING OF PLASTICS

When it comes to finishing moulded plastic parts, you can't beat Severance Cutters. One efficient installation is shown here. A Severance rotary disc cutter mounted on a spindle with an adjustable table allows perfect finishing of the rough edges with amazing speed. Severance disc cutters are made of High Speed Steel, in a wide range of sizes. Staggered pattern teeth produce a shearing cut, eliminate chatter.

If you are having difficulty in finishing manufactured parts, send samples. Our Engineers will design cutters to solve your problems.

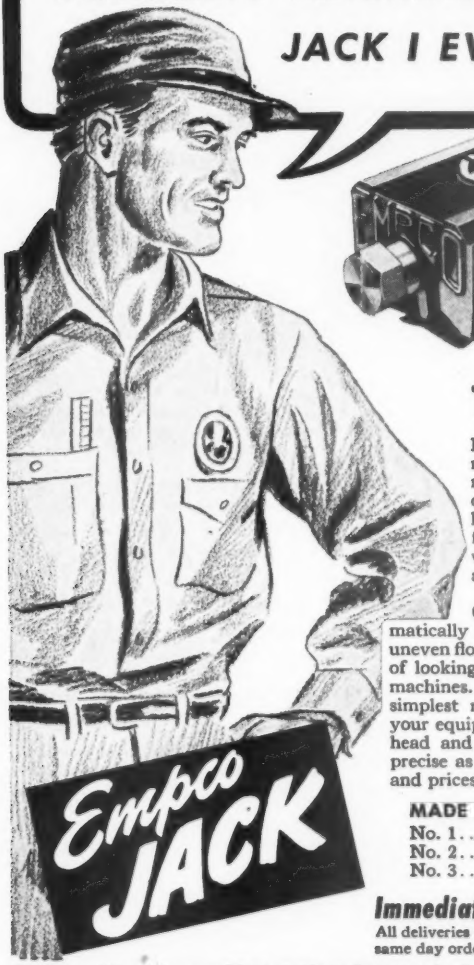
Severance complete line of "Carbide" Midget Milling Cutters are now available.

Severance



Severance Tool Industries Inc., Saginaw, Michigan. Plants in Long Island City, N. Y.; Detroit, Mich.; Fort Wayne, Ind; Chicago, Ill. and Los Angeles, Cal.

THAT EMPCO JACK IS THE MOST ACCURATE MACHINE LEVELING JACK I EVER USED!



A GREAT TIME SAVER

Buy EMPCO Jacks for your machine set-ups—then ask the maintenance man what he thinks of them. You'll find he won't hesitate to tell you that they are far superior to the ordinary wedges, by being more accurate and so much easier to adjust.

The mated castings of EMPCO Jacks are designed to automatically align themselves to the most uneven floors. This eliminates the necessity of looking for level spots to set up your machines. The EMPCO method is the simplest method of setting and keeping your equipment level. Turn the hex screw head and presto—a level adjustment as precise as wanted. Wire or write for sizes and prices today.

MADE IN THE FOLLOWING SIZES:

No. 1	2″	x 2 3/16″	x 4 1/2″
No. 2	2 3/8″	x 3″	x 6 1/8″
No. 3	3 1/8″	x 4″	x 8 1/2″

Immediate Delivery

All deliveries made from stock same day order received.

Builders of Precision machines, parts and accessories for 15 years.

EMPCO

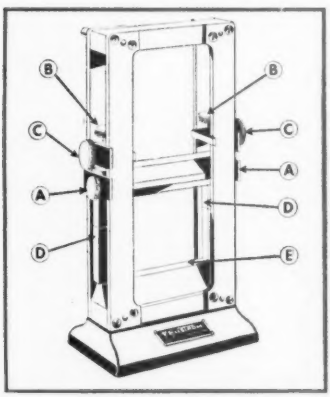
THE ENTERPRISE MACHINE PARTS CORPORATION

2735 JEROME AVE. DETROIT, MICH.

SET YOUR INTERNAL INDICATOR THE ELLSTROM WAY . . .

it's quicker and more accurate

This Internal Setting Gage (Patents applied for) was designed by Elmer Ellstrom of the Dearborn Gage Company to eliminate the old-fashioned time-wasting method of setting instrument and gages by using clamps and parallels with gage blocks. Its gaging surfaces are processed and finished to millionths in flatness, thereby making possible the ultimate in checking with the minimum of adjustments. For example if the gage is adjusted for 2″ reading and a 1.875″ reading is desired it isn't necessary to make a readjustment; all that is required is to wring a .125 gage block on the bottom surface of the gage, immediately giving a 1.875″ check. Wire or write for prices today.



IT IS EASY TO ADJUST

To adjust the Ellstrom gage you merely follow the instructions listed below:

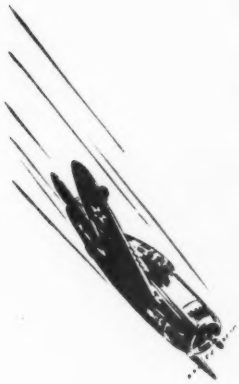
The two screws, A, on upper parallel bar have been carefully adjusted and need not be touched. In raising or lowering the bar loosen only screws C, then place fingers on screws A, and move bar upward or downward as the case may be, but without turning the screws.

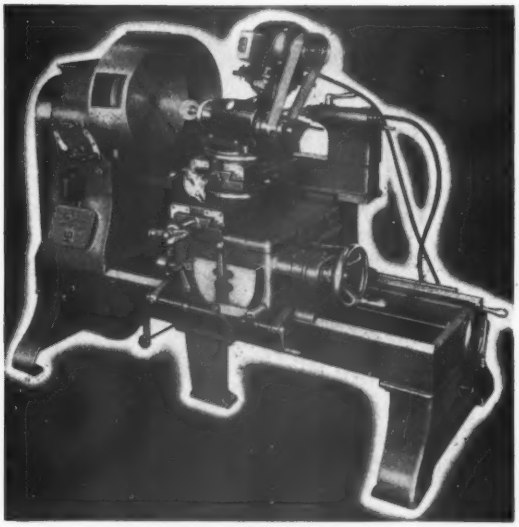
Allow room to place the gage blocks on lower parallel between the posts of the gage. Then lower bar until its surfaces and those of the blocks fit snugly without any forcing. Tighten Screw C lightly and evenly. Screws B are then used to apply slight pressure in making final adjustment.

A film of rust-proof oil has been applied to the entire gage, and can be removed with a clean cloth or if necessary a little naphtha. D gage blocks E stationary parallel.

DEARBORN GAGE CO. 22038 BEECH STREET DETROIT, MICHIGAN

Originators of Chromium Plated Gage Blocks





THUNDERBOLT TAILFORKS . . .

Three types pictured above are all ground to .0002" tolerance fast, accurately, and easily on the new Lempco Model HGX.

MORE THUNDERBOLTS ROAR BECAUSE THE LEMPCO MODEL HGX FINISH GRINDS THEIR TAILFORKS FASTER!

The big 53" swing on the new Lempco Heavy-Duty Universal Grinder is just what the doctor ordered for grinding these fighter craft tailforks. Only one set-up required to finish both bearing lands on this difficult to handle odd-shaped one-piece forging. Turns and grinds, internal, external, face and taper jobs too. 3 Quick-change speeds for both cross-feed and table feed. 360° Compound. Automatic trips and feeds insure skilled work—even from apprentices.

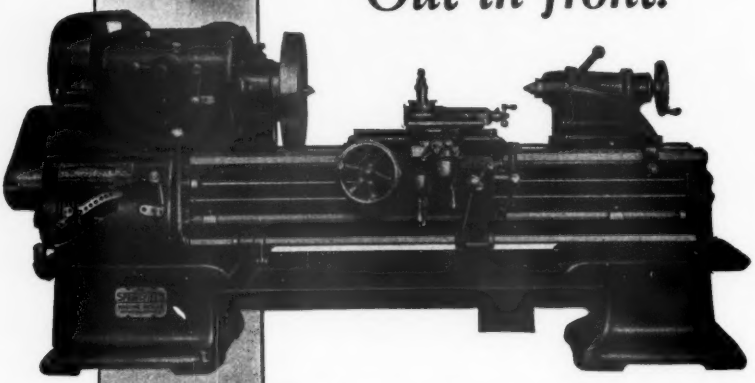
MODEL HGX GRINDERS $3750 GOOD DELIVERY

LEMPCO

5713 DUNHAM RD. • BEDFORD, OHIO

SPRINGFIELD PRECISION LATHE

Out in front!



● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive. Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

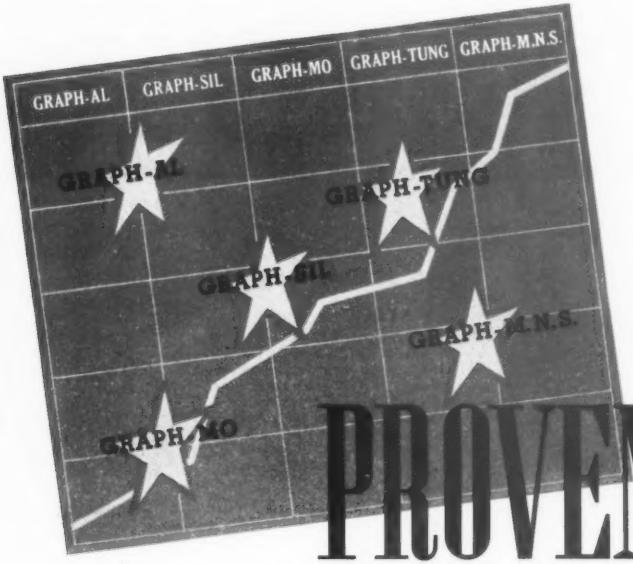
From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*

SEND TODAY FOR BULLETIN No. 163

Tells the why and how of Springfield's accurate production.

THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO. U. S. A.



PROVEN

on the production front

The order of the day is more and faster production. Many manufacturers have found the answer to this urgent demand by the use of one or more of the Graphitic Steels—Graph Al, Graph-Mo, Graph-Tung, Graph-M.N.S.

In a wide series of applications on the actual production front the Graphitic Steels machined at least 25% faster than competing steels, they wore longer and had less tendency to score work. Because each of these steels have been designed to do a specific job, it will pay you to investigate the possibilities they offer in speeding production in your shop. A Timken Engineer will be glad to make the proper recommendations for your particular job. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

Write on your business letterhead for your new copy of the 8th revised and enlarged edition of the illustrated 48 page booklet of Graphitic Steel.

TIMKEN

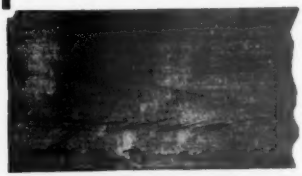
TRADE-MARK REG. U. S. PAT. OFF.

ALLOY STEELS

What is DIE-LESS DUPLICATING?

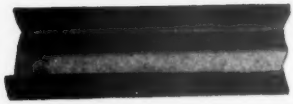
Here is a simple 3-STAGE explanation:

"DIE-LESS DUPLICATING" might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines—Shears, Brakes, Benders —especially when used as a continuous, integrated production process.



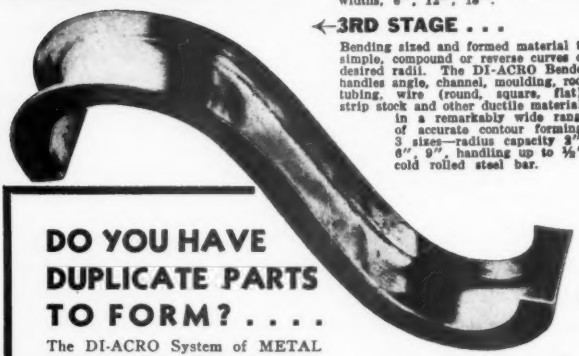
←1ST STAGE . . .

Cutting flat material to size and shape for part to be duplicated. The DI-ACRO shear rapidly resizes and squares material, also makes slits, strips, notches, angle cuts, etc. Guides, stops and blade pitch are all quickly adjustable. 3 sizes—shearing widths 6", 9", 12".



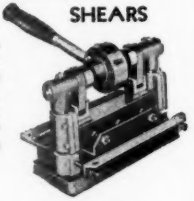
←2ND STAGE . . .

Forming angles, channels or "Vees" from sheared flat material. The DI-ACRO Brake forms any angle from 0° to a maximum of 110°. Contact surfaces are adjustable and may be slotted, recessed or altered as needed for the parts required. 3 sizes—folding widths, 6", 12", 18".

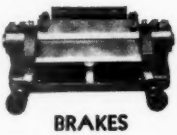


←3RD STAGE . . .

Bending sized and formed material to simple, compound or reverse curves of desired radii. The DI-ACRO Bender handles angle, channel, moulding, rod, tubing, wire (round, square, flat), strip stock and other ductile materials in a remarkably wide range of accurate contour forming. 3 sizes—radius capacity 3", 6", 9", handling up to ½" cold rolled steel bar.



SHEARS



BRAKES

BENDERS

DO YOU HAVE DUPLICATE PARTS TO FORM? . . . .

The DI-ACRO System of METAL DUPLICATING WITHOUT DIES has proven its adaptability in making parts just as accurately as can be done with dies, to a tolerance of .001" in all duplicated work. The delay of waiting for dies is avoided—deliveries speeded up. Changes needed in production can be made simply by adjustment of DI-ACRO Precision Machines, which are also widely used for laboratory and research work, making models, etc. Production work is often done in excess of 1,000 operations per hour, by girls or inexperienced workers.

Send for Catalog—
"DIE-LESS" DUPLICATING

It gives full details on all models of DI-ACRO Shears, Brakes, Benders, and many examples of parts made with "DIE-LESS DUPLICATING".

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

315 EIGHTH AVE. SOUTH **MINNEAPOLIS 15, MINNESOTA**

TURNER PLAST-O-LOCK

(Patent Applied For)

GAUGE SAYS STOP

on its NOT GO member!

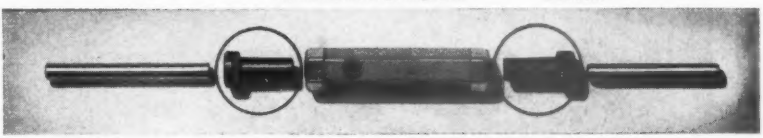
Here's another first by Turner—a *red* plastic collet to more quickly identify the "not go" member of your plug gauges! Plast-O-Lock gauges are great time savers wherever they are used.

Turner's Plast-O-Lock (patent applied for) collet type plug gauges are not only easier to use but they will multiply the life of plug gauges many times. The reason for this is obvious. Because Plast-O-Lock features a collet of plastic, slotted and tapered to fit into the tapered end of a standard plastic handle, it is possible for the gauges to be held securely without their surfaces being scratched or burred, thereby allowing use of most of the gauge's length. For example, as the "go" and "not go" ends are worn beyond allowed tolerances they are simply cut off, thus leaving an unused end ready for gauging. To illustrate further, if a boring no deeper than ⅛" is being checked, as many as 8 fresh gauging sections may be obtained from one standard length "go" gauge as furnished with Turner's Plast-O-Lock. This obviously eliminates the necessity of salvaging used gauges.

For full particulars about Plast-O-Lock gauges wire or write us today.

★ *Features* ★

1. Multiplies the life of the plug gage.
2. Collet will not mar a lapped or polished surface.
3. Used with plastic handle the gauge has a more sensitive feel in the hands of an inspector.
4. Is easy to make length adjustment because slot is provided for end wrench.
5. Plast-O-Lock size range from .050 to .690.
6. Red plastic collet for quick identification of "not go" members.

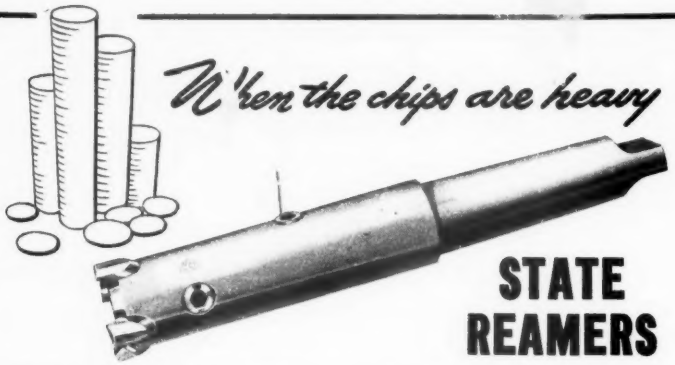


TURNER BROTHERS

DELIVERY Fast delivery can be made on these Plast-O-Lock gauges as well as the following Turner gauges: ring, flush pin, snap and built up.

TURNER GAUGE GRINDING COMPANY

2625 HILTON ROAD . . . . FERNDALE MICH.



When the chips are heavy

STATE REAMERS

COME THROUGH WITH INCREASED PRODUCTION

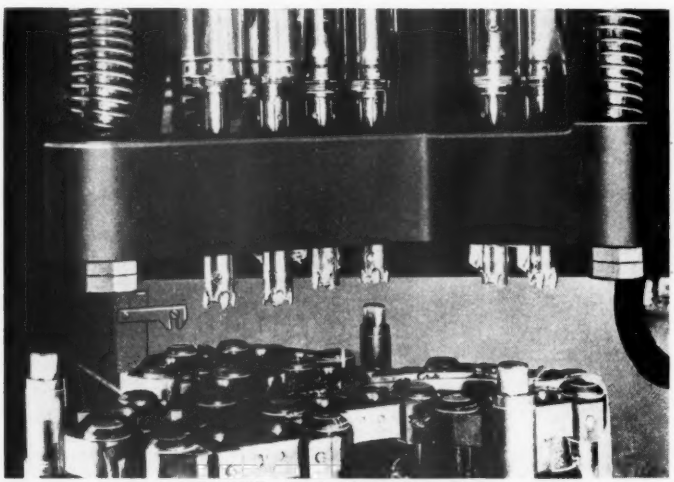
STATE Tools are noted not only for their unusual chip clearance but for many other features including:

1. Quick, accurate, single-screw adjustment.
2. Unusual Bit Expansion insuring many regrinds.
3. Easy regrinding.
4. Solid, sturdy holders of heat treated alloys.

Standard tools are made in 19 sizes to handle ⅞" to 5½".

If our standard models do not meet your needs special tools embodying STATE'S exclusive features *will* solve your problems. Proposals promptly submitted.

A modern high-production plant insures prompt delivery and reasonable prices.



A Typical Production Use of State Tools

★

STATE MANUFACTURING & CONSTRUCTION CO.

FRANKLIN, OHIO

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My Name and **Title**.....

My Company .....

My Plant Address .....

I would like information or literature about the following:

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Key No.	**Key No.**	**Key No.** .....

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Improving Parts Life and Performance ***Reclaiming Undersize Production Parts***
Improving Tool Life and Performance ***Reclaiming Worn Tools and Parts***

● Investigate all possible applications of Hard Chrome Plating to your products and equipment. Experienced Advance engineers are at your service — for consultation and guidance. There is no obligation.

THE *Advance* PLATING COMPANY
1947 W. 28TH STREET • CLEVELAND 13, OHIO

APCO
QUALITY PLATING

FONDA
PRECISION GAGE BLOCKS

DELIVERIES AT THE PRESENT TIME ARE EXCELLENT

SIZE—FONDA GAGE BLOCKS are lapped and inspected under standard temperature (68° F) in a most modern plant.

PARALLELISM AND FLATNESS—FONDA GAGE BLOCKS are parallel and flat. The FONDA designed lapping equipment used in their manufacture does away entirely with the inaccuracies of lapping by hand.

SURFACE FINISH—FONDA GAGE BLOCKS have a truly remarkable surface finish which is unlike that of any other block. This superfinish means resistance to wear as the surface of the block is free of peaks that wear off in use.

STABILITY—FONDA GAGE BLOCKS are stable. Scrupulous care and much time are expended on the extensive processing to ensure stability.

FONDA GAGE BLOCKS are available in Inspection and Working grades at the prices shown. Immediate delivery can be given at present.

PRICES

Inspection Tolerance ± .000004"
82 Unit Set $350.00
35 Unit Set $190.00

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METRIC SIZES ALSO AVAILABLE
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TEN UNIT POCKET SET
Giving 327 Possible Dimensions Obtainable

Block Sizes

.03125	.250
.0625	.300
.100	.500
.125	1.
.200	2.

Inspection Grade
± .000004 in Leatherette Pocket Case $55.00

Send for Descriptive Literature, Dept. C

FONDA GAGE CO.

175 FIFTH AVE.
NEW YORK, N. Y.

Factory: Stamford, Connecticut

GORTON

FOR 50 YEARS
Specialists in
Tracer-Controlled MILLING

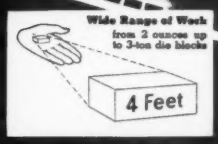
The Right Sized Machine for Every Die and Mold Job. Also Production Milling . . . Profiling

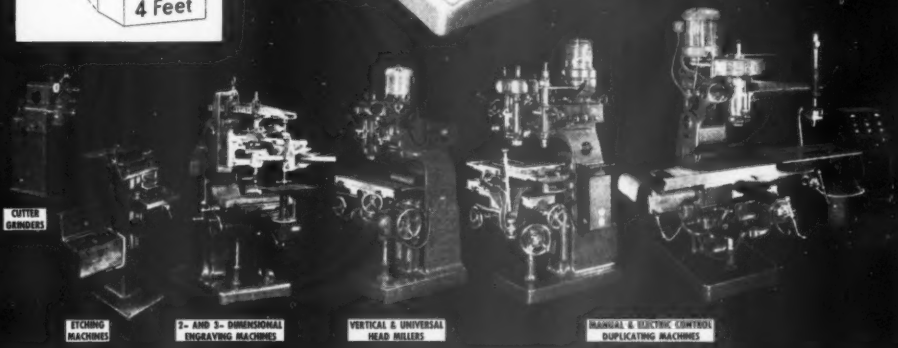
A *Complete* Service

MACHINES from 500 to 21,000 lbs.

SPINDLE SPEEDS from 33 to 12,000 rpm.

SPINDLES POWERED from ¼ to 10 hp.




CUTTER GRINDERS
ETCHING MACHINES
2- AND 3- DIMENSIONAL ENGRAVING MACHINES
VERTICAL & UNIVERSAL HEAD MILLERS
MANUAL & ELECTRIC CONTROL DUPLICATING MACHINES

Check Free Booklets Wanted . . . Tear Off Coupon and Mail . . . No Obligation

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- ☐ Millers—Duplicators Instruction Manual
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Company Name_____ Address_____ State_____

GORTON
50 YEARS OF PRECISION TOOLS

GEORGE GORTON MACHINE CO.

1319 RACINE STREET, RACINE, WISCONSIN, U.S.A.

DUSTKOPS

STOP DUST

from ALL

Abrasive Operations

Entirely Self-contained. Motor, fan, cyclone separator and filter. Fast installation. Flexible metal hose permits installation complete in minutes.

Compact and Portable. Even the biggest DUSTKOPS will usually fit in the existing space behind or beside the grinder.

Send now for complete information. To save time, describe the source of the dust when you write.

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Detroit Office: CAdillac 3090—Zone 26

MODEL 950
has a cyclone separator.

"READY TO GO" this model is for medium duty work of all kinds.

MODEL 600
has a spun glass filter.

Ideal for light duty production surface grinding.

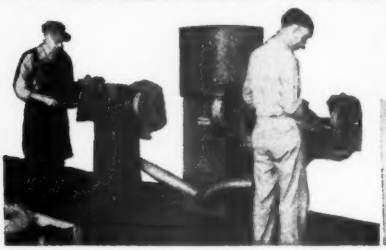
MODEL 600
Spun Glass Filter

For smallest grinders, laboratory work.

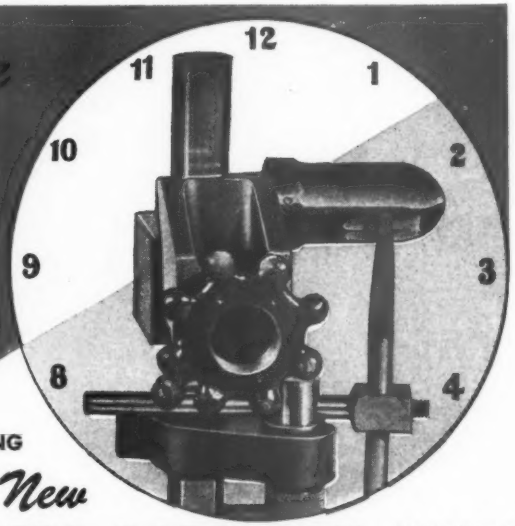
MODEL 1250
has a cyclone separator.

Handles all the dust from this armor grinding job easily.

Four wheels exhaust into a single Model 1250 that gets all the dust.



Save MAN HOURS forming DIE SINKING TOOLS



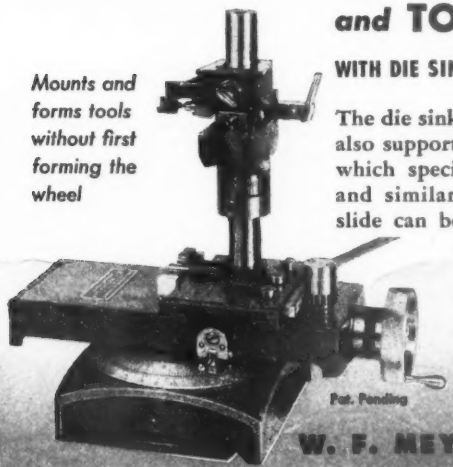
BY USING

The New

MEYERS RADIFORM WHEEL and TOOL FORMER

WITH DIE SINKING TOOL ATTACHMENT

Mounts and forms tools without first forming the wheel



The die sinking tool attachment will also support end mills and drills on which special points are desired—and similar tools. The compound slide can be replaced with a small motor to form sockets and various other forms and difficult production pieces. Write for descriptive literature.

Pat. Pending

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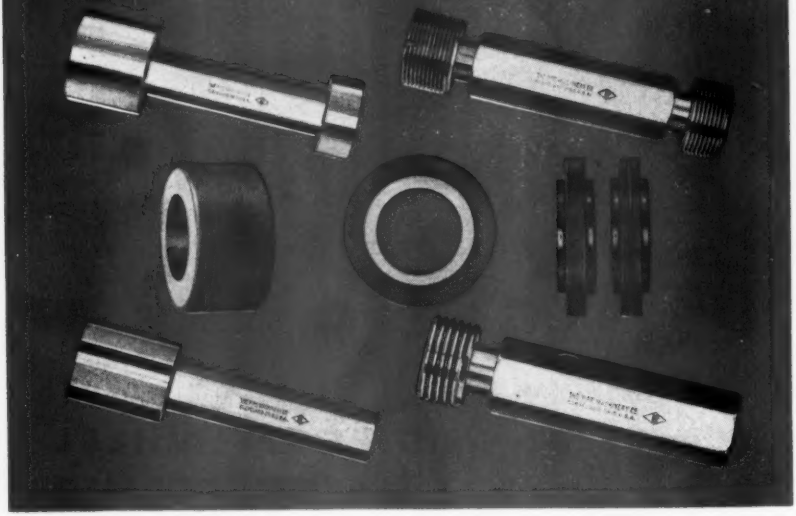
1016 FOURTEENTH STREET • BEDFORD, INDIANA

Wire Department EX

FOR GAGES YOU NEED IN A HURRY!



Standard Thread, Plug and Ring Gages—sizes No. 4 to 1½", and many other minor diameter plain plugs—are carried in stock for prompt shipment by air express, rail express or mail.

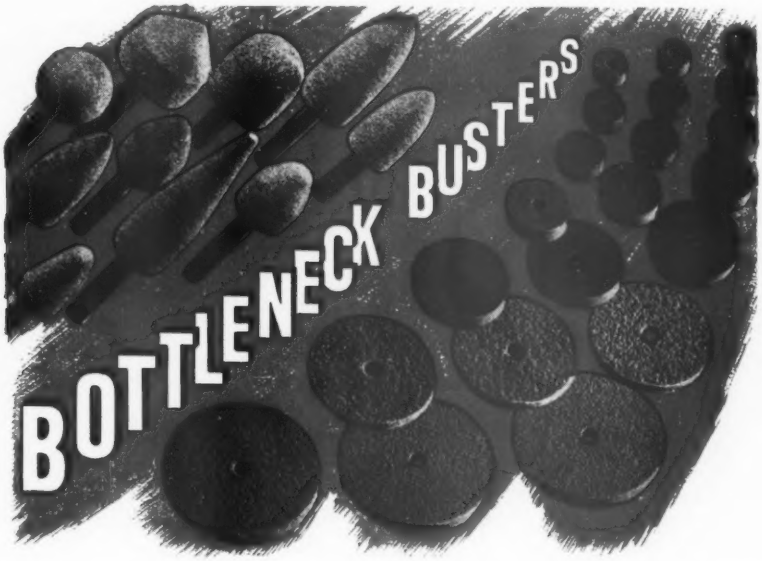
Due to varying demands on this stock, we cannot always guarantee immediate delivery, but we do positively guarantee that every Gage carrying the PM Diamond Emblem conforms to the industry's highest standards of accuracy, finish and quality.

Wire Department EX for prompt service. Refer to your PM Gage and Small Tool Manual for complete information—and write for a new copy of this useful book if you need it.

PM CO

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS



CHICAGO MOUNTED WHEELS—The first small wheels ever mounted on stationary shanks, they have maintained their supremacy through the years. Over 300 sizes, styles and grains—one to suit every job. They're tough, long lived, dependable.

CHICAGO GRINDING WHEELS—To break production bottlenecks due to the crying need for small wheels, we gave up making all larger sizes for the duration — with full WPB approval — and now specialize on sizes 3" in diameter and under.

America's Unbeatables

Yes, all the wheels in our line are small, but powerful and *swift tools of war* doing their stuff day in and day out — making it possible to speed through everything that requires precision internal or external grinding, polishing and burring — bombsights, planes, tanks, guns, intricate instruments, etc.

• *Half a century of specialization has established our reputation as the Small Wheel People of the Abrasive Industry.*

PROMPT DELIVERY—Come to America's Headquarters for Small Wheels, custom built to your order. No waiting for shipments now, and after the war a reliable source of supply. Our central location is another asset — cuts shipping time to most plants.

Send the Coupon for Illustrated Catalog

CHICAGO WHEEL & MFG. CO.

1101 W. Monroe St., Dept. TD, Chicago 7, Ill.

Test Wheel Free—
So that you will know what Chicago Wheels can do, we'll gladly send one without charge. Tell us material you want to grind and size wheel you'd like.

TD-1

Send catalog. Interested in ☐ Mounted Wheels ☐ Grinding Wheels ☐ Send Test Wheel. Size____

Name_____

Address_____

USERS ACCLAIM NEW

MELIN Long Life High Speed 3-FLUTE END MILLS

MOST IMPORTANT END MILL DEVELOPMENT IN 20 YEARS!

"COMBINES in a SINGLE TOOL ALL the ADVANTAGES of 2 and 4 FLUTE MILLS . . . with NONE of the DISADVANTAGES of EITHER!"

"NOW POSSIBLE to HOG and FINISH with same type of tool!"

"COMBINES FAST STOCK REMOVING QUALITIES of 2-FLUTE MILL with SMOOTH FINISHING QUALITIES of 4-FLUTE MILL!"

YOU, TOO, can profit from these **3-FLUTE** advantages: Permits roughing and keyway milling to be done within closer limits and with a smoother finish . . . provides perfect balance and thus does away with flutter and chatter at high speeds . . . gives closer control in cutting . . . guarantees extra sturdiness.

WRITE TODAY FOR COMPLETE DETAILS AND NEW CATALOG

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☐ Complete details on MELIN 3-FLUTE END MILLS.
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NAME_____ TITLE_____

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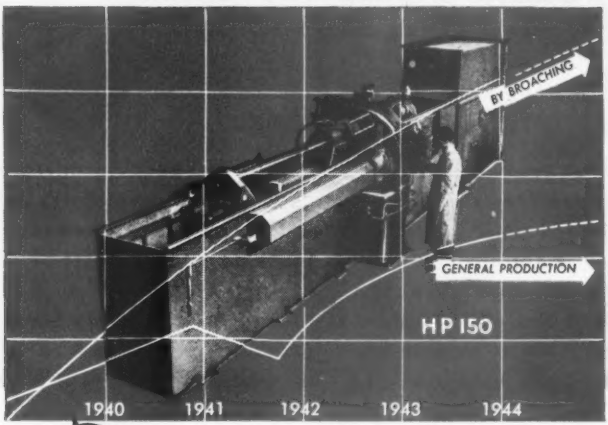
PROTECTION...

of Vital Production

of Vital Manpower

of Vital Time

BROACHING PRODUCTION FIGURES BASED ON ACTUAL SURVEY—



ARMY E NAVY

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

Sav-way Announces—

A NEW SET OF MASTER SETTING AND CHECKING ROLLS

A Really Accurate Method for Checking Micrometers and Other Precision Inspection Devices

Your precision tools and inspection devices are only as accurate as the methods and gages by which they are set and checked. When anvils are worn unevenly, flat gage blocks are not adequate. This Sav-Way Set of Master Setting and Checking Rolls provides for the first time a really accurate means of checking micrometers, snap-gages, amplifiers, and dial indicators under all conditions of wear. The set consists of 20 rolls ranging from .100" to 2.000" in diameter. Rolls are hardened, ground, and lapped to X gage tolerance. The set is housed in a modern transparent plastic case.

Send the Coupon for Illustrated Circular and Price

Sav-way **INDUSTRIES**
Products Division
4875 EAST 8-MILE ROAD • DETROIT

SAV-WAY INDUSTRIES
Box 117, Harper Station, Detroit 13, Michigan
Please send complete description and price of Sav-Way Master Setting and Checking Rolls.

Name _____
Firm _____
Address _____
City _____

FIRTHITE Lamination Dies have blanked, on one grinding, more pieces than an alloy tool-steel die punched in its entire "life." (On this operation a good steel die produces about a million pieces.) This Firthite Die has produced, with only a few honings, over ten million pieces and may be good for as many more.

Firthite Dies retain their original sharpness much longer than any steel dies. They cut clean and free—reduce burring, distortion, dimpling, and buckling. Firthite Dies also resist chipping or breaking, even in case of a miscut. They are superior for notching as well as blanking. A Firthite Engineer will gladly give you details.

Firth-Sterling
STEEL COMPANY
McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA
CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

11
COLONIAL
SURFACE BROACHING
MACHINES
now do the job of
60
MILLING MACHINES
in producing
66
DIFFERENT PARTS
in
13
OPERATIONS
EACH

You can figure for yourself what that means in the way of flexibility and of savings in manpower, capital investment and manufacturing cost. However, if you would like the whole story, ask for a copy of Colonial's

BROACHING NEWS, Vol. 5, No. 4

(Right) One of the most flexible of machines, this Utility Press—one of the machine types referred to above—may be used for both broaching and other types of press work. It is thus well adapted to the requirements of the smaller or medium-sized shop as well as where higher production is required.

colonial BROACH COMPANY
DETROIT 13, U.S.A.
Broaches Broaching Machines - Broaching Equipment

Today's production program demands accurate, efficient cutting tools within easy reach. Gairing standard kits (particularly recommended for tool rooms, machine, die and repair shops) provide the answer for all counterboring, countersinking and spot-facing operations.

There are seven sets from which to choose. Set B-4 is illustrated here. Each contains tools designed with special features to meet different requirements—each is a logical assortment of interchangeable counterbores, pilots and holders neatly boxed in sturdy wooden cases with stout hinged covers.

FIRST AID FOR THE TOOL ROOM

Write us today for our four-page Counterbore Bulletin illustrating, describing and pricing all seven sets.

Gairing TOOLS

The interchangeable holders in these sets are of Morse Taper or straight shank type. (Optional.) Threaded shank pilots are of selected alloy steel hardened and ground on the head. Shanks are drawn and treated to obtain unusual toughness and strength. High speed steel counterbores are renewable. The use of these interchangeable assemblies assures large savings over the old fashioned solid integral pilot type.

All counterbores, pilots and holders selected are standard items of the most active sizes used. Replacements may be quickly obtained from stock.

Gairing Interchangeable Counterbore Set No. B-4

GAIRING
FOR OVER A QUARTER CENTURY SPECIALISTS IN FINE CUTTING TOOLS

THE GAIRING TOOL COMPANY, Detroit, Michigan

Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools

CUTTING THE TOUGHEST JOBS ON *EVERY* TYPE OF ARMAMENT

SIEWEK-BUILT "PROGRESSIVE"

SHEAR-CUT END MILLS

Working hard to help make American armament the best and most powerful in the world, Progressive "Shear-Cut" End Mills are cutting clean, fast and long on the toughest jobs.

That's because they are precision made of the finest materials, to feed accurately, minimize chatter, give adequate chip clearance and uniform cutting action. Rigidly held, these End Mills will permit working to extremely close limits.

Progressive End Mills are now being manufactured by the Siewek Tool Division of Domestic Industries, Inc. . . . the same high character product, the same old family of skilled workers—plus the wider resources of Domestic Industries, Inc. for added manufacturing facilities and improved customer service.

Remember, the name "Progressive" has always and will continue, to signify "superior tools for superior work."

SIEWEK TOOL DIVISION
OF DOMESTIC INDUSTRIES, INC.
Detroit (Ferndale Station) Michigan
Designers and Builders of
JIGS, FIXTURES AND SPECIAL MACHINES

DISTRIBUTORS IN PRINCIPAL CITIES

AFFILIATED WITH SIEWEK ENGINEERING DIVISION - CHICAGO - DETROIT - HARTFORD—a nationally known organization staffed with experienced engineers—Consulting, Processing, Designing, Fabricating and Efficiency Methods

THERE'S A *New* HEAVY WEAPON ON THE CUTTING LINES, TOO-IT'S *Super DBL* HIGH SPEED STEEL

IN the M-12 Tank Destroyer, above, Army Ordnance has combined the great hitting power and range of the 155 mm gun with the speed and mobility of the medium tank chassis. The result is a weapon that not only can stop any enemy tank now or likely to be in the field, but can blast out land strong-points or sink a ship.

In similar fashion, Allegheny Ludlum technicians have added cobalt to the familiar AL-developed DBL low-tungsten moly analysis. The result, *Super DBL*, is a high speed steel of maximum red hardness for heavy duty work—a material that delivers top performance at the same time that it conserves strategic materials.

Super DBL has been thoroughly proved in service. Use it for your heavy roughing and "hogging" jobs—it's suitable for anything from hard, gritty materials to tough, heat-treated alloy steels. ● Full information is available in the *"Super DBL* Blue Sheet". Write for your copy, or for the assistance of our Mill Service Staff in selecting the proper grades of AL Tool Steels for your various production jobs.

Available

IN THESE FORMS

★ Hot Rolled and Forged Bars in all necessary sizes.

★ Ground Bars: rounds in sizes up to 3" dia. —polished, standard ground or rough ground finishes.

★ Hardened and Tempered Tool-Holder Bits in sizes from 3/16" to 1", packed in one or assorted sizes as needed. Also special sizes as may be required.

NOTHING NEW TO LEARN IN HEAT TREATMENT OR SHOP HANDLING

Address Dept. TD-20

Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

A-9075A...W & D

WHY *EASY-FLO* BRAZING OF BROKEN CUTTING TOOLS IS SPREADING SO FAST

Summed up in one sentence . . . it's because Easy-Flo brazing is ideally suited for tool repairs. It is simple . . . it is reliable . . . it is economical. It requires no unusual skill. If an operator is handy with a torch, he can do a good job. And even this skill is not so important where heating is done by furnace, salt bath or other methods.

Easy-Flo is the key to the success of this low temperature tool brazing method, because thin films make exceptionally strong joints, and Easy-Flo is so free flowing, it penetrates readily into close clearances. And most important, its low flow point has so little effect on a tool's hardness that rehardening is unnecessary.

Here's an example . . . an 8-pound helical milling cutter. In one hour, including all operations, it was ready to go back to work. A few cents worth of Easy-Flo did the job as against about $60.00 for a new cutter.

GET EASY-FLO DETAILS IN BULLETIN NO. 12-A . . . Write for your copy today and start salvaging your cutting tools the simple, reliable, economical, Easy-Flo way.

ARMY E NAVY

FOUNDED 1907

HANDY & HARMAN

82 FULTON ST., NEW YORK 7, N. Y.

Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada

Agents in Principal Cities

BELLOWS CVH-60 AUTOMATIC VISE
CUTS LOADING AND UNLOADING TIME 40%

THE Bellows CVH-60 Automatic Milling Machine Vise eliminates hand clamping, opens and closes automatically with movement of machine — often doubling, even tripling production.

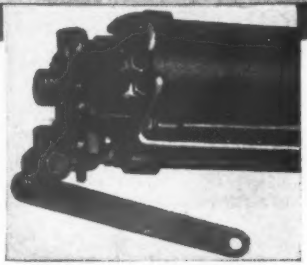
Uniform, positive clamping prevents loose parts wrecking cutting tools, lessens rejects due to inaccurate milling caused by parts moving in the vise.

The CVH-60 Vise is all-steel construction, powered by the Bellows Air Motor, developing a clamping pressure up to 40,000 lbs., at 90 lb. line pressure. Low air consumption. Automatic oiling. Overall size: 27¾" long, by 6" wide, by 4⅞" high. Jaw opens to 5⅜".

Simple Advantages That Mean

FASTER PRODUCTION

- Automatic Opening and Closing of Vise Jaws
- Uniform, Unvarying Clamping Pressures
- Clamping Pressures Adjustable from 1 lb. to 40,000 lbs.
- Sufficient Pressure to Hold Any Part
- Fits Any Standard Milling Machine



Integral Valve — with Valve Control Adjustable to "any angle in any plane"

Double-acting valve, integral with vise, is equipped with the famous Bellows finger-tip control, permitting operation of the valve from "any angle in any plane." Control may be synchronized with machine movement to provide fully automatic operation.

Write for Bulletin CVH-60A.

The Bellows Co.

ESTABLISHED 1911

861 EAST TALLMADGE AVENUE, AKRON, OHIO

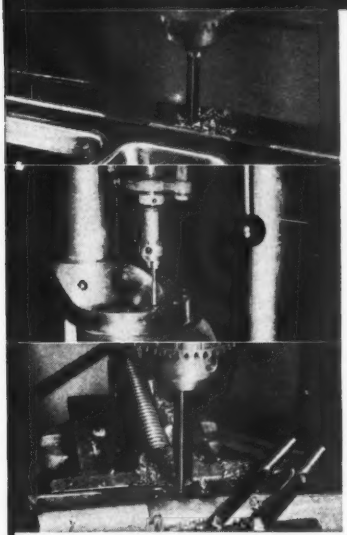
Selecting for each job the *right* cutting tool—right type, right form, right size—is the first rule of tool conservation. Proper choice in the first place, and care to see that this choice is maintained, will help produce more and better work.

NATIONAL

TWIST DRILL AND TOOL COMPANY

HOME OFFICE AND FACTORY—DETROIT, MICH.

A Vital Aid to PARTS RECOVERY— "HARDSTEEL" DRILLS



SAVES DIES. On a crimping die for making aluminum mess trays for the Navy, the diemaker forgot to drill for the gage pins before final hardening. On the stamping die he neglected to drill a vent hole before the die was hardened. All holes were drilled after hardening with "HARDSTEEL" drills and two expensive dies were saved.

SAVES MACHINED PARTS. "HARDSTEEL" drills are now regularly used to remove broken taps in blind holes in Wright engine crankshafts without defacing the threads. This method requires only 2 to 2½ hours—saves 6 hours compared with the former grinding method and results in 100% parts recovery. Hardness of the taps is Rockwell "C" 60-65.

SAVES TOOLS. This big broach broke through the slot while in service. It was full high-speed steel—yet with "HARDSTEEL" drills it was found possible to drill three half-inch holes through the shank and the broach was quickly placed back in service.

"You Harden It . . . We'll Drill It"

Parts recovery saves labor costs, machine costs and critical material. Having "HARDSTEEL" drills on hand for emergencies may mean the difference between meeting a production quota and falling behind.

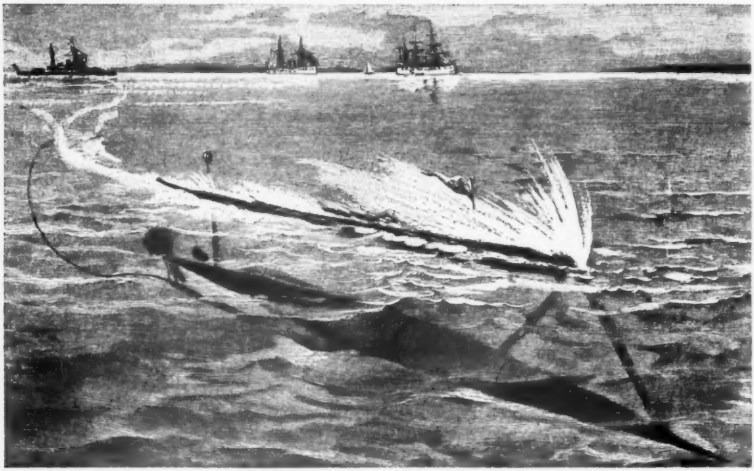
No charge for "HARDSTEEL" Operator's Manual telling how to drill steels hardened by any process.

BLACK DRILL CO., 1400 East 222nd Street, Cleveland 17, Ohio

"HARDSTEEL"

DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

"This is a Grinding War . . ."



EDISON'S FISH

Here's a "secret weapon" that never went to war. But it caused a lot of excitement back when Dad was a boy!

It was called the Sims-Edison electric torpedo—a motor driven torpedo supported by a float and controlled and powered through a long extension cord!

It's a far cry from Edison's fish to the modern pneumatic torpedo which contains thousands of moving parts, is built like a watch, costs around $20,000 and rolls off production lines in staggering numbers.

When you consider what an intricate mechanism the torpedo is—and that it is only one item on today's list of war weapons—can you but marvel at America's war output?

That output is a miracle of mass production that was made possible, in part, when, over fifty years ago, the first man-made abrasive was created and the grinding wheel became a production tool.

Since then, engineers have learned how to grind mechanical parts to split-hair accuracy. This accuracy led to interchangeability of parts. And interchangeability, in turn, made mass production possible.

Today you can't put your finger on a single weapon that flies, sails, rolls, shoots or explodes that isn't in some way touched by grinding. Knowing that "this is a grinding war," we at Carborundum are acutely conscious of our responsibility to war industry. And we are constantly striving to develop new ways in which grinding can serve you better to help win the war.

But we are also mindful that grinding plays a part in the production of nearly every article built for peace and that today's grinding developments will have a wider application than ever after Victory.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

REG. U. S. PAT. OFF.

Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company

MAINE STEEL, INC. *Reports . . .*

"Greatest Time and Money Saver in Die-sinking Machinery in 25 Years!"

"You may remember that about a year ago you sold us a Rotary Head Die-Sinking Machine. We feel that it is time that we told you what we think of it.

The Rotary Head principle has saved us more time and money than any other improvement in Die-Sinking Machinery since Cherrying Attachments were invented more than twenty-five years ago.

The principal reason is that we can sink four (4) impressions complete without moving the work on the table.

This saves three (3) setups out of four (4) when compared to a Rotary Table Machine.

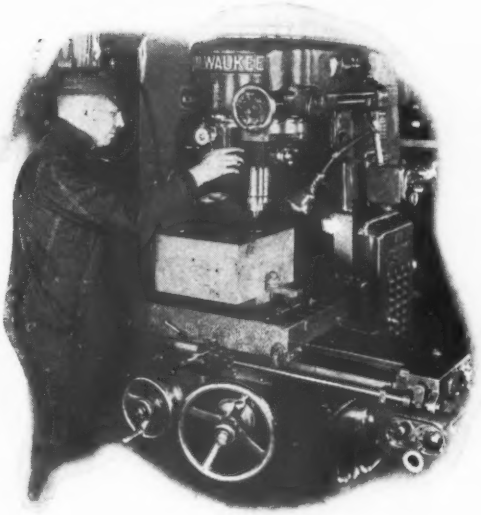
This saving would of course be increased where more than four (4) impressions are needed.

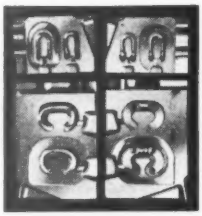
Besides this — the various movements built into this Rotary Head enable us to sink our dies without first laying them out on the Die Blocks.

The machine does its own layout work.

And after a year's experience we can say that these two features have averaged to save us over 30% of our die-sinking time.

Yours very truly,
MAINE STEEL, INC.
A. A. Rines
Foreman—Die Sinking Dept. "





This is typical of the forging dies produced by Maine Steel, Inc. The Milwaukee Rotary Head Miller has saved this firm over 30% in die-sinking time on dies of this type.

Kearney & Trecker's Rotary Head Miller is regarded by the majority of users as the most versatile machine ever designed for die and mold work. Direct — fast — accurate — it reduces initial job preparation and set-up time to the minimum — saves operator's time and assures rapid production of dies and molds. Write for Bulletin No. 1002C for full information on this unusual machine tool.

Rotary Head Milling Machine
Autometric Jig Borers
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
Milwaukee Midgetmill
Milwaukee Speedmill

Practically every firm engaged in war production will find this Ex-Cell-O heavy-duty tool grinder answering a definite need. It provides for a 14-inch wheel at each end and is specifically suited to the proper conditioning of medium and large size turning, boring, facing, and planer cemented carbide tools, as well as stellite and high speed steel tools. Ex-Cell-O Standard Style 49 Tool Grinder is built for dry grinding, or it can be supplied, as extra standard equipment, equipped for wet grinding. Write for Bulletins Nos. 46511 and 46101. They give specifications and other information on Ex-Cell-O's complete line of Tool Grinders.

EX-CELL-O CORPORATION • DETROIT

XLO
EX-CELL-O for PRECISION

EX-CELL-O Precision MACHINES AND TOOLS

Adaptable to...

LATHES
MILLING MACHINES
SHAPERS
BORING MILLS
GEAR HOBBERS
DRILLS
AND MANY OTHER MACHINES REQUIRING SELECTIVE SPEEDS

Large enough to successfully serve you, yet small enough to give personal attention to your needs.

In selecting machine tool drives to speed up production, it is extremely important that you consider all of these factors ... Speed, Dependability, Safety and Ease of Operation, Improved Lighting and Flexibility in Machine Positioning.

Lima Gearshift Drives are engineered to give you all of these advantages, and built to withstand the toughest production schedules without interruption.

Investigate Lima Gearshift Drives today. Install them now for Faster War Production, and for Greater Peace Time Profit after the war is won. Write or wire today for address of Lima Engineering Service nearest you.

THE LIMA ELECTRIC MOTOR CO.
872 Findlay Road
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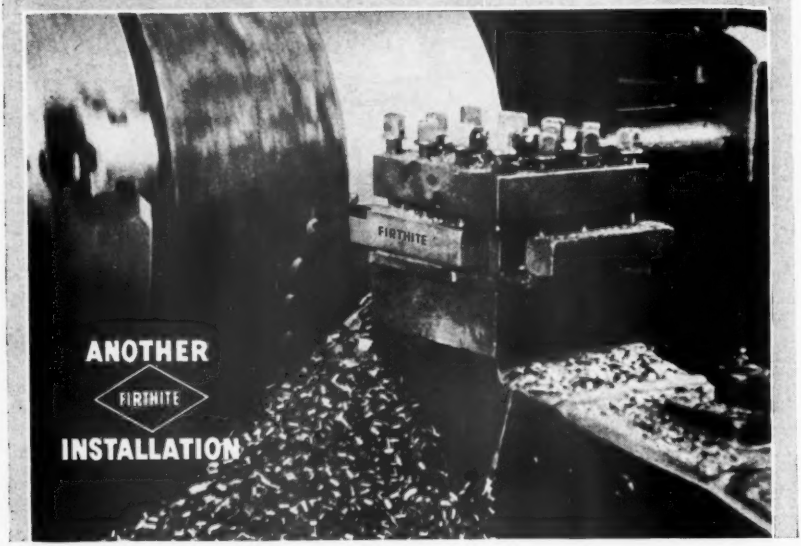
REPRESENTATION IN MOST PRINCIPAL CITIES
LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS
LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS

730 POUNDS OF CHIPS PER HOUR!



Simultaneously in **boring** these castings, FIRTHITE Tools take five shocks per second on a severe, interrupted cut.

On **rough turning** this 20″-dia. gray iron casting, with only chuck support, a FIRTHITE Sintered-Carbide Cutting Tool takes a ½″ cut, 0.042″ feed at 170′ per minute—far beyond the capacity of high-speed steel tools.

FIRTHITE cuts clean and free with little pressure at high speeds . . . produces remarkably smooth and even finish. For **super** production, on **any** metal or non-metal, investigate FIRTHITE. Write today for descriptive literature.

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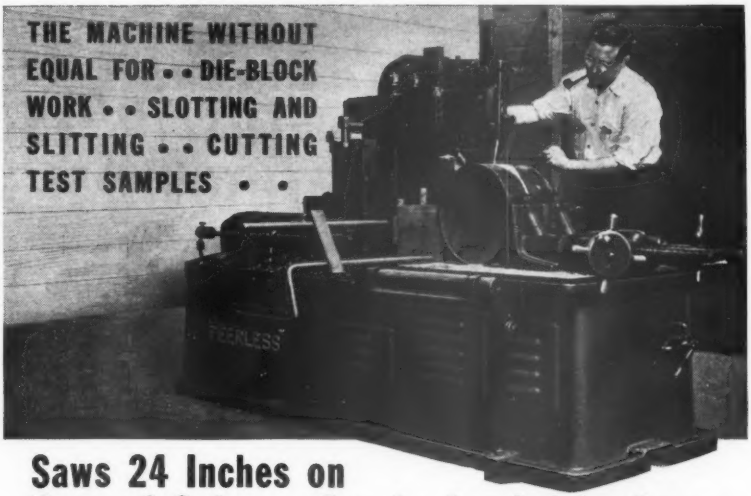
STEEL COMPANY
Offices: McKEESPORT, PA. NEW YORK · HARTFORD · PHILADELPHIA · CLEVELAND · DAYTON · DETROIT · CHICAGO · LOS ANGELES
MAKERS OF HIGH-SPEED STEELS, TOOL AND DIE STEELS, AND SINTERED CARBIDES

THE PEERLESS VERTICAL SAW



Saws 24 Inches on Face of Cut . . . Can be Loaded by Crane

PEERLESS is the only hydraulically controlled metal cutting saw that will handle 10 x 24 in. stock without turning the work. Only a few thousandths need be allowed for planing. Large working table permits loading by crane.

Peerless is the only metal cutting saw with full automatic, hydraulic control of the feed, blade lift, blade return and elevating rollers.

Because Peerless cuts so true and square, critical stock is saved, enabling tool and die makers to use scrap pieces for smaller dies, strippers and stripper plates. Mail the coupon for estimate of cutting time on your toughest operation and full details of the Peerless Vertical Metal Cutting Saw.

PEERLESS MACHINE COMPANY, 1600 Junction Ave., Racine, Wis.

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PEERLESS MACHINE COMPANY, Dept. TDJ-144, Racine, Wis.

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Company.....

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City.....State.....

WHEN you use TECO Cemented Carbide tools, you'll find it unnecessary to maintain excessive reserve stocks of cutting tools. You actually get *more* production with *fewer* tools, because TECO Cemented Carbide stays on the job longer—produces more pieces than any other cutting material.

Extremely hard, dense and uniform in structure, TECO Cemented Carbide has unusual resistance to wear and breakage in high speed turning, boring and facing operations.

Our manufacturing facilities assure prompt and dependable shipment to meet your production requirements. Grades, styles and sizes for practically every machining need.

Write today for catalog giving full specifications.

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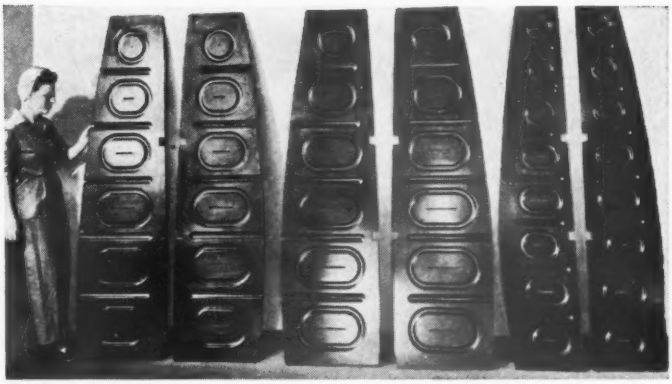
TECO *Pioneers in Tungsten Carbides for over a Quarter Century* TECO **CEMENTED CARBIDE**

Meet the Light-weight Champion

MASONITE* DIE STOCK



These six-foot wing rib dies, used in a hydro press, are made of Masonite Die Stock. Photograph courtesy of Schlenzig Manufacturing Company, Camden, N.J.

ALTHOUGH it's only one-sixth the weight of steel, Masonite Die Stock is proving to many aircraft manufacturers that it can stand up to the toughest jobs.

Even in large dies, you don't have to worry about this material bowing or taking a set after routing for beading and lightening holes. Masonite Die Stock has high compressive and flexural strength. Dies remain flat.

This amazing semi-plastic material can be fabricated in pattern or metal shops in a fraction of the time required for metals . . . stands up under present-day production requirements . . . saves time, money and effort.

Because of their remarkably light weight, dies made of Masonite Die Stock can be easily handled in and out of hydro press or power brakes by either men or women. Hoists and cranes are rarely required.

This modern, dependable die stock is available in thicknesses of ¼ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For details, mail coupon below.

*TRADE-MARK REG. U. S. PAT. OFF. "MASONITE" IDENTIFIES ALL PRODUCTS MARKETED BY MASONITE CORPORATION. COPYRIGHT 1943, MASONITE CORP.

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Please send me illustrative literature and complete information about Masonite Die Stock.

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IMMEDIATE DELIVERY FROM STOCK

LEVER-TYPE SpeediChuk

WITH THE Precision BREN COLLET

- Increases ½" collet capacity lathes to ¾".
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- Ready for instant use and interchangeable on any 1½" x 8 thread spindle lathe . . . Atlas, Logan, 9" South Bend, Clausing, etc.
- Full Spindle Accuracy.

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LIST $79.50
Collet extra

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HANDWHEEL SPEEDICHUK

List Price $19.75, Collet extra — For use where quantity production is not required. Lathe must be stopped to open and close collet.

GENERAL DIE-STAMPING-TOOL COMPANY

PRECISION COLLET DIVISION 265 Canal Street, New York 13, N.Y.

These SPECIAL TOOLS

developed for the manufacture of

BAZOOKA PROJECTILES

Just one of many instances where MOTOR TOOL *designing and production facilities* have been utilized in turning out intricate SPECIAL TOOLS required in the producing of essential war materiel.

Whatever YOUR requirement—however unusual the cutting operation—you can be sure of getting the precise tool you need if it is . . .

REFINED AND PRODUCED *by*

MOTOR TOOL MANUFACTURING CO.

METAL CUTTING TOOLS

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"Make it a Rule to Call Motor Tool"

DIE SPRING* FAILURE CAN BE CHECKED

* and other types of springs as well!

● Die spring breakage can be traced in almost every instance to one or more of the following causes:

Improper clearance, consisting of insufficient space between spring and guide rod (or guide hole). Correct by providing a clearance that permits the spring to operate freely, but still prevents buckling.

Incorrect size and design. Springs often fail when repeatedly compressed through their full range of deflection, or when operated too rapidly. Only springs designed for both the length and speed of the compression stroke should be selected.

The surest way to avoid failure is to check a Muehlhausen Die Spring Folder, which lists 200 sizes by rod and hole diameter, free length and load capacity for high speed, regular speed and heavy duty work. *Send for Die Folder today!*

MUEHLHAUSEN SPRINGS
EVERY TYPE AND SIZE

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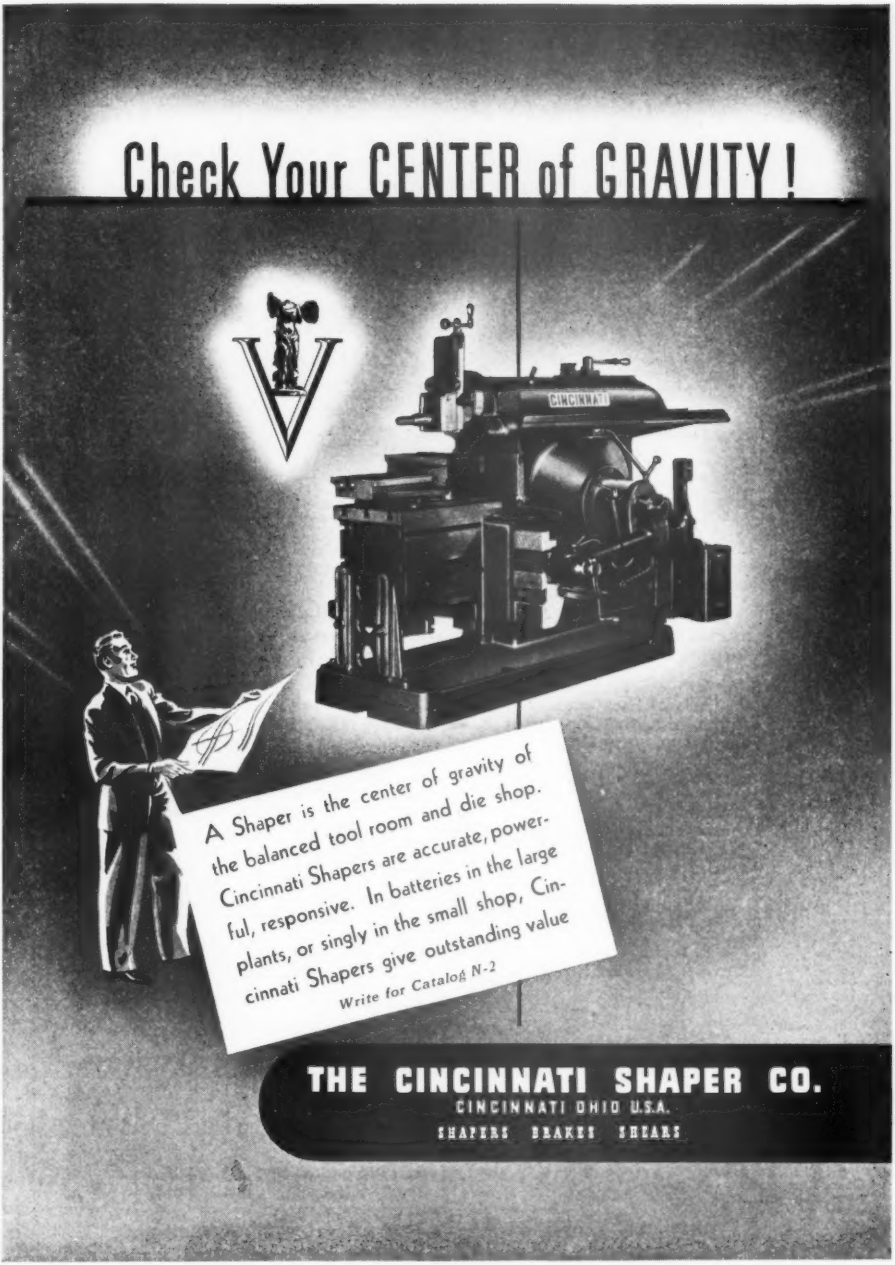

A Shaper is the center of gravity of the balanced tool room and die shop. Cincinnati Shapers are accurate, powerful, responsive. In batteries in the large plants, or singly in the small shop, Cincinnati Shapers give outstanding value

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SHAPERS BRAKES SHEARS

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In the sense that outstanding manufacturers from the four corners of the country come to McKinney for assistance this is in fact national headquarters for production tool engineering — and building too.

A roster of our customers would be a "who's-who" in manufacturing attainments and would include the names of many organizations that have been in the news because of special accomplishments — or the recipients of merit awards for outstanding production.

Our organization of tool engineers and highly skilled craftsmen takes special pride in serving this kind of exacting manufacturers and derives a sense of satisfaction in making a substantial contribution to the country's amazing production accomplishments.

If you are looking for this kind of service we are confident of being able to serve you with the utmost satisfaction.

Write for explanatory bulletin or ask us to have a McKinney representative call.

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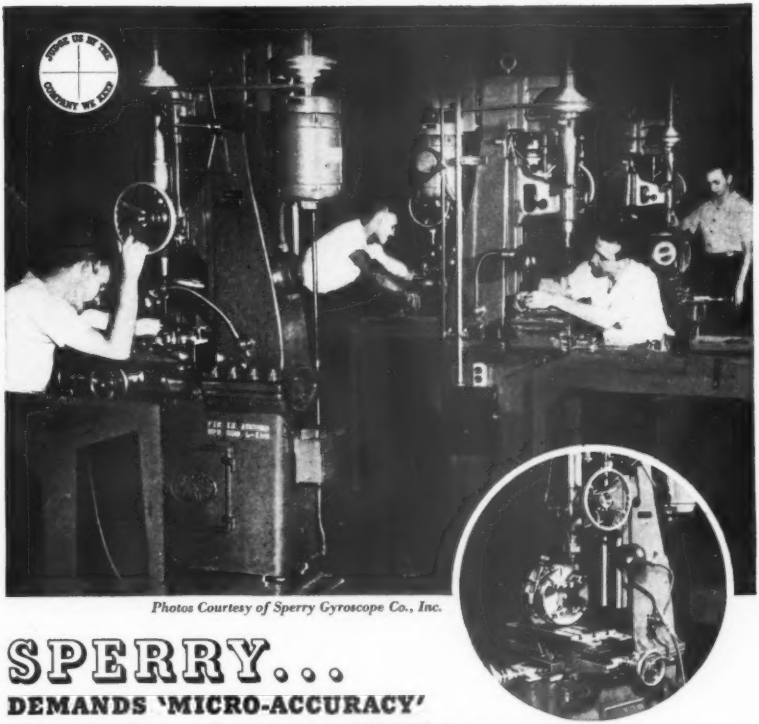
DESIGNERS and BUILDERS of PRECISION TOOLING
Since 1920
1673 ARABELLA ROAD
Tools·Dies·Jigs·Fixtures·Special Machinery



Photos Courtesy of Sperry Gyroscope Co., Inc.

SPERRY...

DEMANDS 'MICRO-ACCURACY'

Moore Jig Borers Reply with .0002" Tolerances

High on the list of war devices upon which Uncle Sam's armed services depend for their striking power are those that bear the name of SPERRY. Tolerances in tenths are the rule rather than the exception at the Sperry Gyroscope Company, Inc.

The Moore Jig Borer meets all requirements of accuracy, efficiency and ease of operation for the boring of holes in jigs, fixtures, dies, gauges and special, accurate machine parts. It is highly sensitive for holes of 1/32" diameter and yet rugged for heavy cuts up to 4½". Operators can spot, drill, ream and bore in one uninterrupted sequence.

PARTNER in Production ○ This companion machine, the Moore Jig Grinder, corrects and finishes jig-bored holes on both hard and soft work within .0001". We will be glad to show you how the "Partners in Production" can modernize your toolroom operations.

MOORE SPECIAL TOOL COMPANY INC.

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SPEED

SPIN THE HANDWHEEL and the ram speeds to the work by fast mechanical action instead of slow, laborious hydraulic pumping.

FLIP THE BALL ARM to close the valve instead of slowly turning a handwheel type control.

START PUMPING and immediately get tons of pressure on the work because the hydraulic cylinder was automatically filled with oil during oper. No. 1.

3 QUICK MOTIONS OPERATE KRW HYDRAULIC PRESSES!

SPEED is the basic design feature of KRW Hydraulic Arbor Presses—*they are faster than most power-operated presses.* In operation, you get *speed* in bringing the ram to the work ... *speed* in developing hydraulic pressure... *speed* in raising the ram to remove the work. These KRW features have sold thousands of our hydraulic presses to industry where they are doing work formerly considered only possible on larger, heavier and more costly equipment. Ingenious adaptations of KRW presses have been built to handle many kinds, sizes and types of material. All, of course, incorporate the KRW principle of SPEED in operation. Write for our new bulletin describing KRW Hydraulic Presses in 25, 50, 60 and 75-ton capacities.

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on AA-4 Priority or better

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ACCURATE AT ANY ANGLE!

◀ OBLIQUE

Grinding grooves in rolls for tube forming machine, with Dumore mounted on compound of engine lathe, using special bracket of simple design.

VERTICAL ▶

Dumore No. 5 mounted vertically in a Bridgeport Universal Miller, grinding the contours of a motor lamination die. For vertical mounting, the quill is provided with a special oiling system to assure adequate lubrication of the top bearing.

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Ingenious mounting of Dumore on double overarm of Milwaukee Miller, permits free use of table for attaching indexing fixture in grinding teeth of gear hob.

Amazing versatility of the Dumore together with its high precision convert any available machine tool into a special purpose precision grinder for a wide variety of operations. Catalog 42 is full of helpful suggestions and application data. Get a copy; write today!

The Dumore Company, Grinder Division, Racine, Wisconsin.

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PRECISION and Off-Hand GRINDERS

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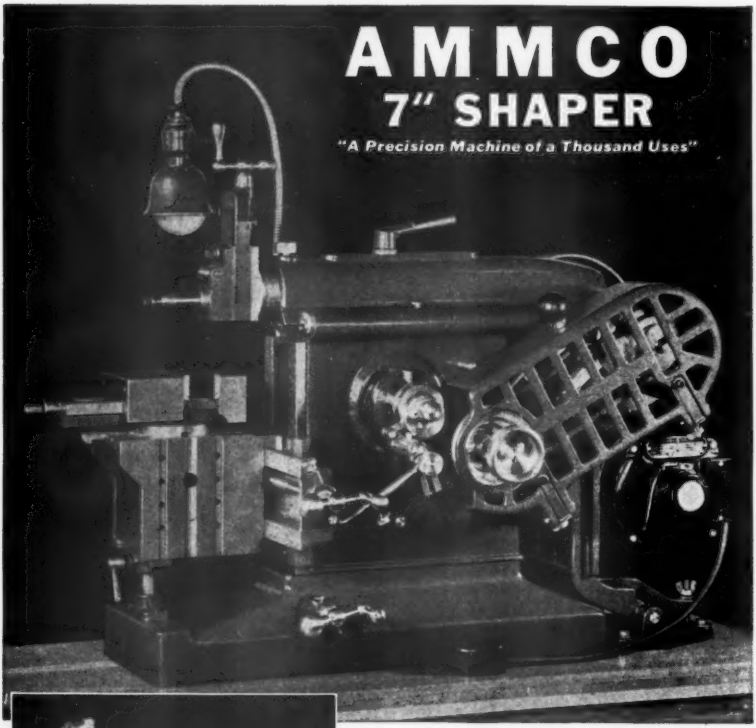
AMMCO
7" SHAPER

"A Precision Machine of a Thousand Uses"



IT'S PORTABLE

- **Saves time and steps!**
- **Can be moved from job to job in tool and die shop!**
- **Just wheel up to bench--plug in--and go to work!**

On jobs requiring a stroke of 7" or less, the AMMCO 7" PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet model enables this shaper to be moved about the shop.

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Write today for specifications and prices

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THE FIFTY TO ONE FILE FOR FASTER CUTTING IN HARDER METALS

Fifty to one—that's the performance you'll get from Ford Carbide Cutters over those of ordinary high speed steel. It's the *Quality* tool—harder biting, faster cutting, longer lasting—keeps production at its peak. Available in 20 sizes and 7 shapes. Write today for complete details from FORD, on carbide, the Aristocrat of Files.

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SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1 Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.

2 Saves time and expense of drawing or tempering small metal parts in large furnaces.

3 Cuts handling time when normalizing or annealing small parts. No waiting.

4 Conveniently available for pre-heating for subsequent high-speed hardening.

5 Eliminates shut downs and delays in servicing emergency repair orders.

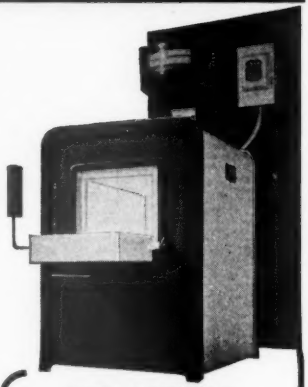
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$124.00*
MH-4	10″W 6″H 18″L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel — furnace structure remains undisturbed.

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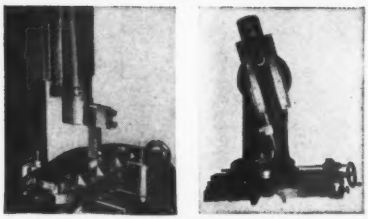
DOUGLAS *Precision* MACHINES

The Douglas Precision Slotter is adaptable to both tool room and production work. Swiveling ram head with tool holder and rotary table often solves the problem of costly fixtures. Automatic feeds in all directions — 7" to 10" stroke.



Typical production parts machined on a Douglas Slotter.

FOR TOOL ROOM AND PRODUCTION

Prompt Delivery to War Plants

The Rotorex Universal Tool and Cutter Grinder will accurately perform all kinds of tool grinding operations. Readily interchangeable attachments are available to set up machine for single-purpose jobs such as cylindrical, internal and radius grinding.

Operation showing set-up for internal grinding.

Operation showing set-up for sharpening straight gash hobs.

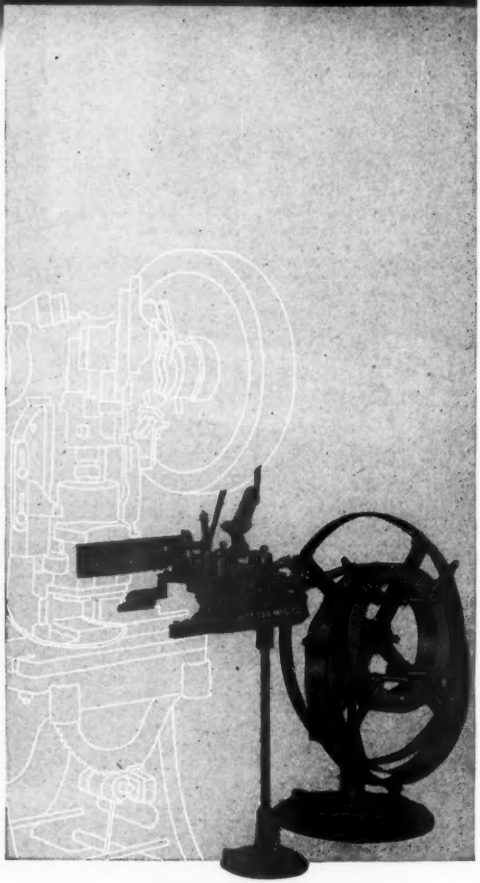
DOUGLAS MACHINERY CO., Inc.

150 BROADWAY • NEW YORK, N. Y.

Our Punch Presses Are More Flexible And Productive With WITTEK *Automatic* Roll Feeds And Reel Stands

Manufacturers of metal stampings facing problems in the feeding of coiled strip stock to punch presses will find that Wittek Automatic Roll Feeds and Reel Stands conserve man-hours and achieve new high production levels.

Providing an improved and simplified method of punch press operation, Wittek Automatic Roll Feeds and Reel Stands insure rapid, safe and accurate feeding under all conditions. Made in four different types to meet all automatic feeding requirements. Write for complete details. Wittek Manufacturing Co., 4305-15 West 24th Place, Chicago, Ill.



ARMY-E-NAVY

WITTEK WMCO *Automatic* ROLL FEEDS and REEL STANDS

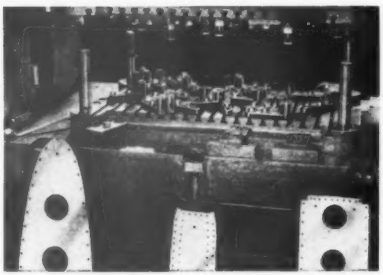
For All Makes and Sizes of Punch Presses

ADJUSTABLE DIES
SPEED WAR PRODUCTION

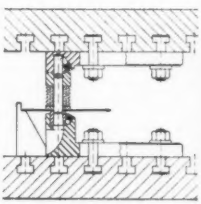
INCREASE HOURLY PRODUCTION—REDUCE "DOWN" TIME

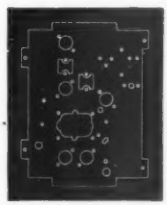
Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by...saving weeks of time normally required in single purpose die making...units can be used over and over in different patterns...new set ups on or off the press in minutes ...all parts interchangeable...work on any type press...perfect precision on long or short runs...no special tools and new workers quickly learn to make press changes.



Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.





Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.

Over 25 Years of Tool and Die Making Experience

S. B. WHISTLER & SONS, Inc.
752-756 MILITARY ROAD BUFFALO, N. Y.

Every Production Executive needs this fully illustrated catalog. Sent upon request.

Tannewitz DI-SAWS

have LARGER CAPACITY, saw *Easier*, STRAIGHTER

In making inside and outside cuts on dies, tools, jigs, etc., as well as inside and outside filing and polishing, the modern die saw will save upwards of 70 per cent of the time required by ordinary methods and reduce costs proportionately. Don't overlook this great opportunity to step up both production and profits. But be sure to get the machine that gives you the added advantage of EXTRA CAPACITY (a full 24 inches between the blades) and the easier and straighter cutting that naturally follows from the use of larger wheels. Get the complete facts concerning the TANNEWITZ M-24, the most highly developed die saw on the market. Simply write for our DI-SAW Bulletin. Also describes larger DI-SAWS for special applications.

Other bulletins on request: Single and Variable Speed Foundry Band Saws; SHEET METAL CUTTING Band Saws.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

SAVE PRODUCTION TIME

with a

SHOPLIFTER

One man can handle heavy dies alone. Not necessary to stop other machines to get help.

MORE production per day from your machines if a Shoplifter is handy to do the heavy job of moving dies from storage racks to the press. In these times when maximum production of machines is of vital importance, much time and labor can be saved if the operator can handle the heavy work of changing dies without calling for help from other operators.

The Shoplifter is built for this job. Dependable and safe with a rated capacity of 500 lbs. (heavier machines up to 5000 lbs. can be furnished). Entire machine built of structural steel. Electrically welded throughout. Platform lifts 54" above floor and lowers to within 5½" of floor. Overall height 72". Size of platform 24"x24" wood deck. Crank, up and down, hoist unit.

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Price $147.50

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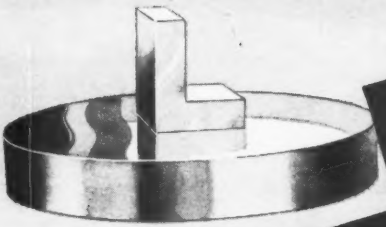

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(Over complete surface)

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12" and 16" dia.
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TOOL MAKERS' KNEES
(Faces 2½"x4"—2½"x3")
Grade 1 —
30 seconds of angle
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Flats and knees polished to closer tolerances available.

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6 outstanding advantages

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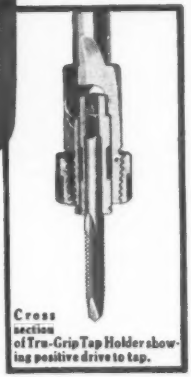

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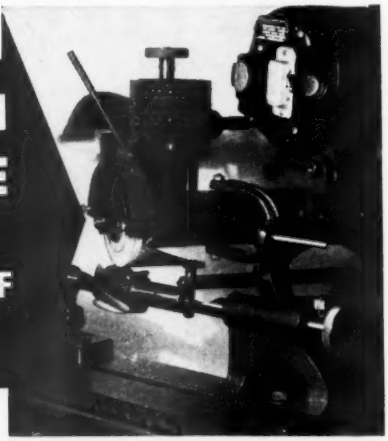

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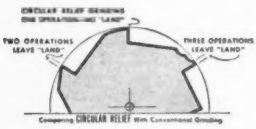
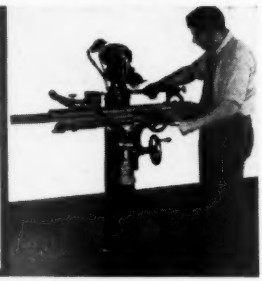


Note from diagram how CIRCULAR RELIEF GRINDING *follows curve* of tool, grinds right up to cutting edge and does not cut away valuable metal supporting the cutting edge.



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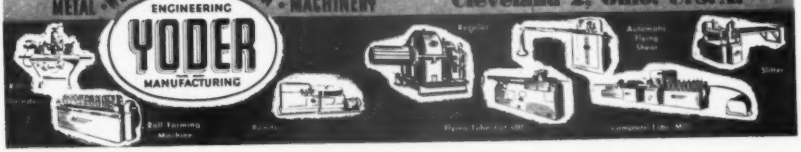

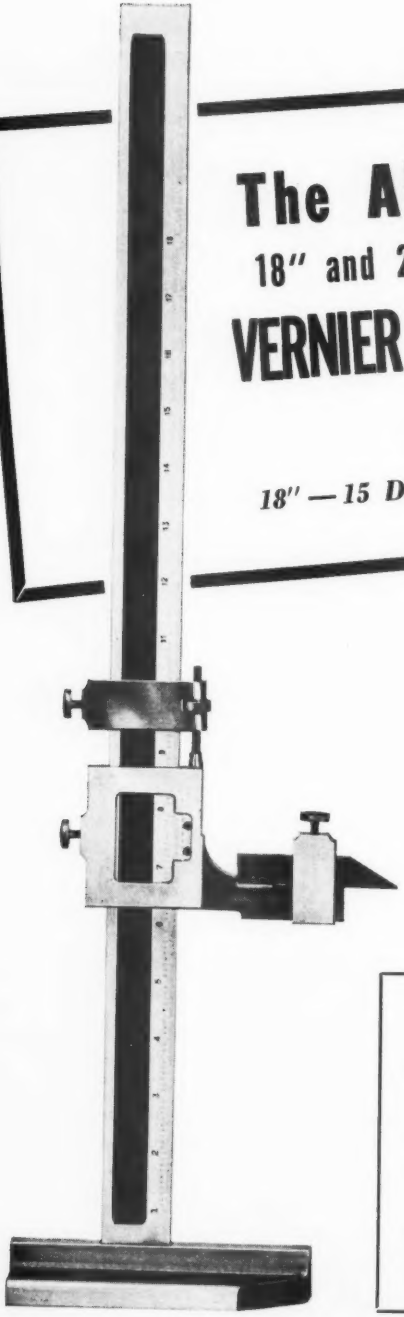

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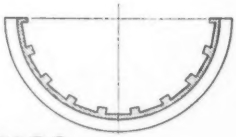

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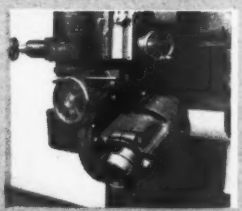
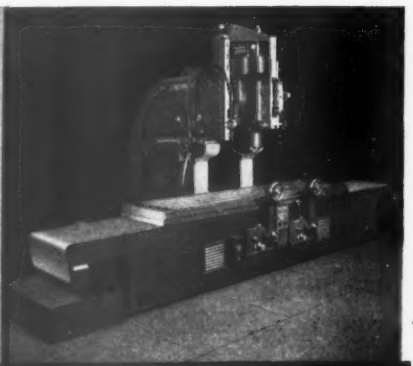
Right: CINCINNATI 28" Series Vertical Hydro-Tel Milling Machine. Specification catalog M-1018-2 gives complete information.



Above. Universal Index Milling Attachment. It has No. 50 standard taper hole; quick change collet; 1½ to 1 speed ratio, index plate for locating angular position of attachment spindle.



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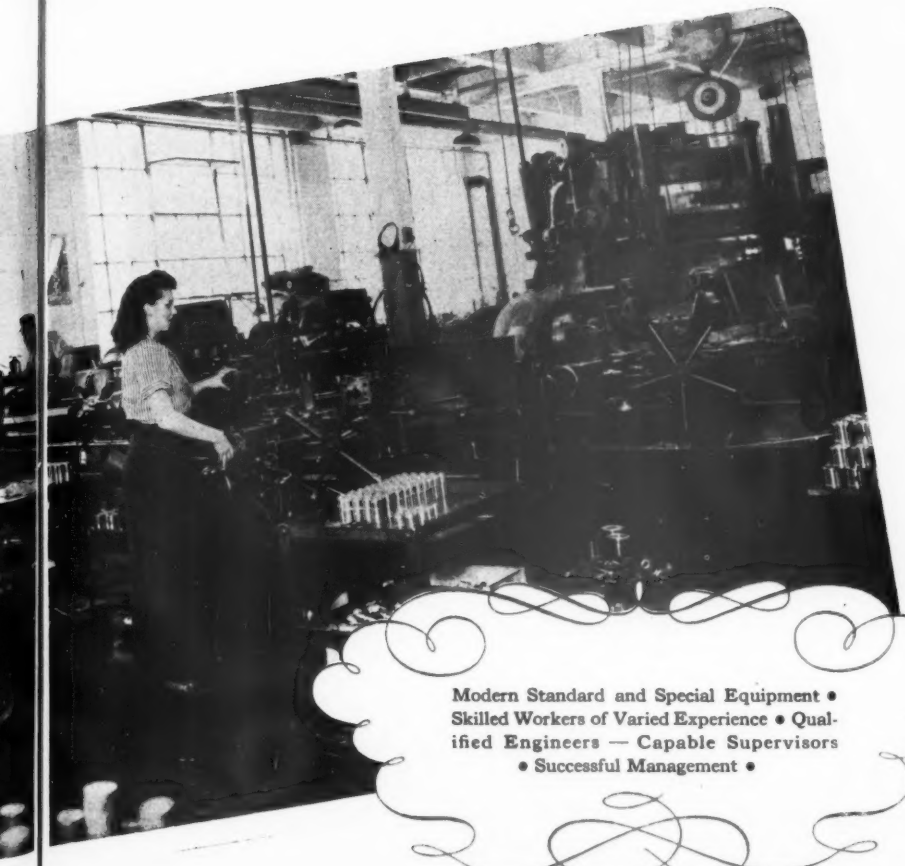

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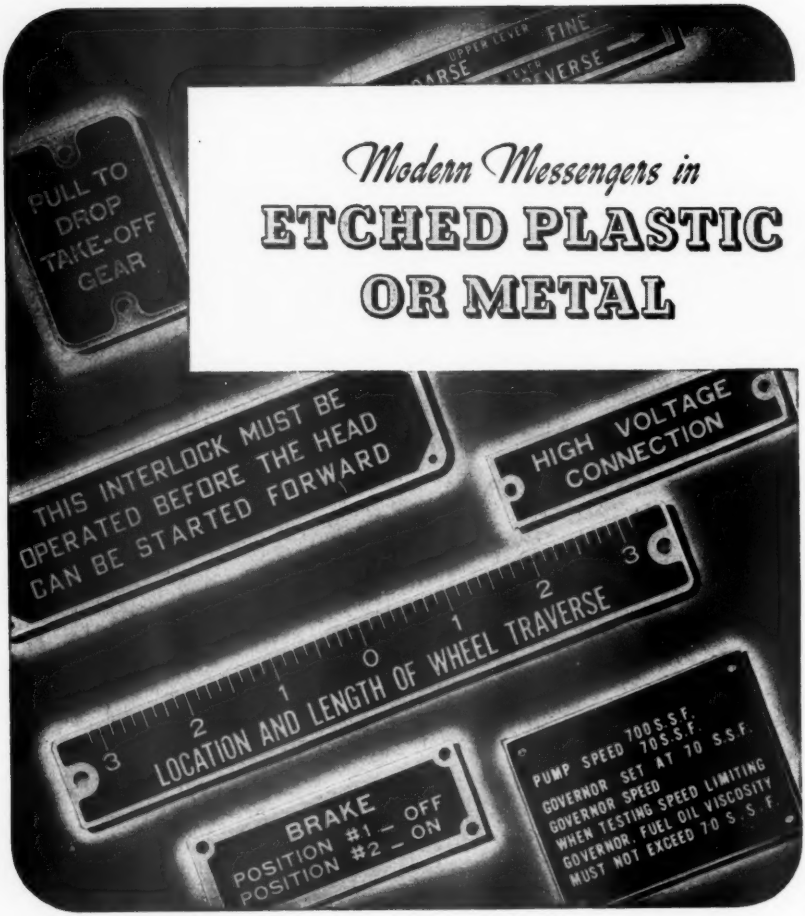
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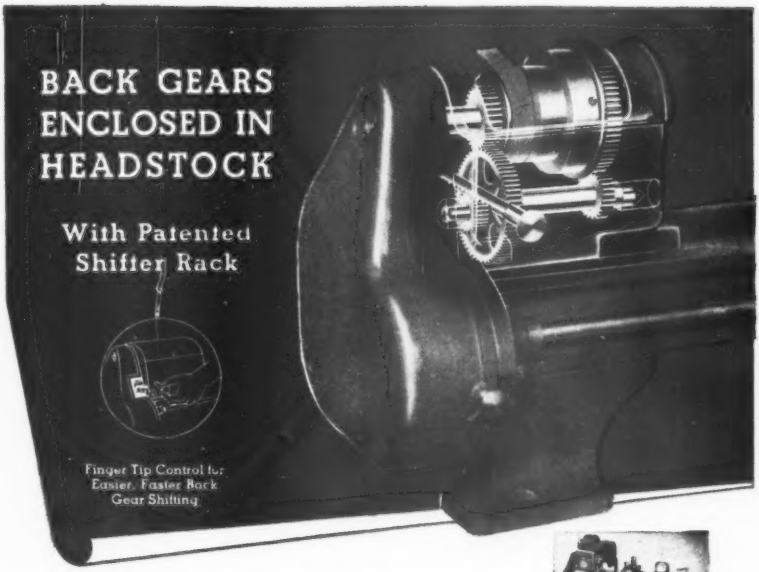

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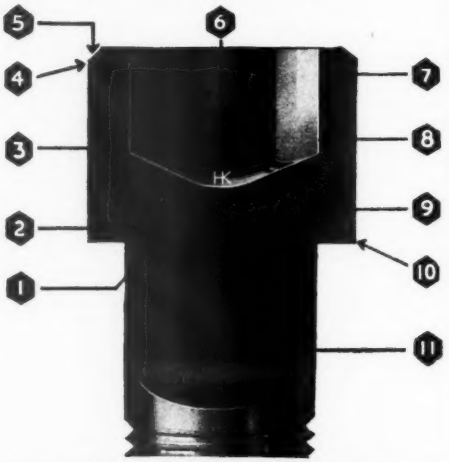

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HOLO-KROME SOCKET HEAD CAP SCREW

HOLO-KROME SOCKET SCREWS

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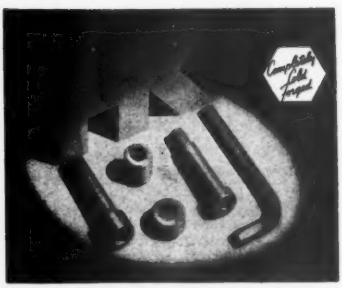

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Vol. IX, No. 10 • January, 1944

Contents

Editorial	George J. Huebner	77
An Introduction to Powder Molding		78
Modern Designs for Drilling Jigs and Tapping Fixtures	C. W. Hinman	86
Accuracy, and the Geometry of Precision	E. Willard Pennington	99
Industrial Plastics	Gordon B. Thayer, Technical Consultant	103
Circular Relief for Bent Shank Taps		106
Welded Fabrication and Production		110
Drawing Fine Uncoated Steel Wire	R. R. Preston	117
Industrial Digest		122
Progress on Parade		125
Publication Previews		131
Shop Aids		163
Index to Advertisers		225

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SURVEY OF BUYING INTENT

A SURVEY just completed by the Chamber of Commerce of the United States provides us with a very pertinent estimate of what American families are thinking about buying when the war ends.

We have about thirty-five million families in the Country, of which 64% or almost two thirds, have named one or more important products of industry as likely purchases "if the war were to end tomorrow." The survey is based upon personal interviews with families who are in the income groups of $4,000.00 and less per year; the sampling thus is believed to have covered the American mass-production market, as it reaches both city and rural families. The table which follows shows quantities which the Chamber of Commerce believes may well be considered a reflection of buying intentions. If such buying were to be done over the period of the first twelve

Product	Wanted	1940 Sales	1941 Sales
Automobiles	3,675,000	3,464,000	*3,838,000
Mechanical refrigerators	2,625,000	2,600,000	3,500,000
Washing machines	2,100,000	1,552,000	2,014,000
Radios	2,555,000	11,531,000	13,700,000
Stoves	1,645,000	.....	.....
gas	.....	1,742,500	2,400,000
electric	.....	450,000	728,000
Vacuum cleaners	1,400,000	1,742,000	2,117,000
Electric irons	1,505,000	5,171,000	5,585,000
Electric kitchen mixers	1,085,000	460,000	510,000
Sewing machines	840,000	(not at hand)	(not at hand)

*Including Government purchases

months immediately following the war, it would constitute, in comparison with sales in 1940 and 1941, quite a satisfactory production.

This poll of American families, aimed at forecasting their buying intentions, probably would make an even better showing if more were known about time-payment plans. And of even greater importance could be the resumption of advertising and of sales solicitation and the return of descriptive literature.

The figures in the table should give automobile, mechanical refrigerator, and washing machine manufacturers considerable confidence in the future, because their sales volume would compare favorably with 1940 and 1941. The electric kitchen mixer seems to be in line for 100% step-up. Stoves probably would make a better showing if installations in new homes and apartments could be assured and included in the figures.

(TO PAGE 119—PLEASE)

Geo. J. Hubner

Editor

INTRODUCTION TO POWDER MOLDING

by Irving D. Press

THE current war production program has disclosed both a lack of widespread knowledge of the techniques of powder molding and a parallel need for concise and authentic outline material to facilitate the training of designers and set-up men for powdered metal products manufacturing. This data, therefore, is intended to familiarize a newcomer to the powder molding field with some of the terms encountered, the operation of an automatic, mechanical, powder molding or briquetting press (which type handles the bulk of powder molded parts production), with molding problems frequently encountered, important die design factors and the technique of setting up and adjusting an automatic press. Fig. 1 shows the basic elements in a powder molding die and Fig. 2 shows a front view of a simple automatic, mechanical, press of the double action type for the briquetting of powder materials with a molding die mounted in the press. The press components are marked with the letter "P", and the die components are marked with the letter "D".

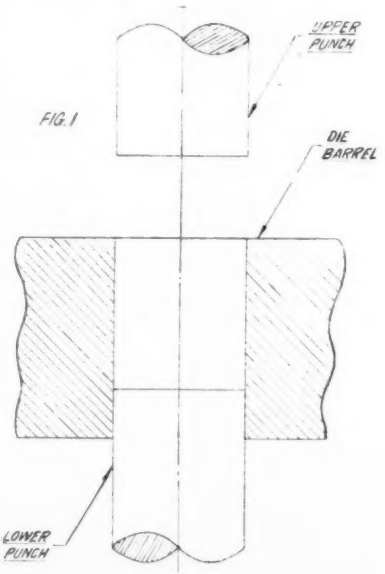
The axis of pressing is defined in this and most other cases as the axis along which the punches move. There are exceptions and the use of side punches is one, but these are rare, and for all general purposes we can consider the axis of pressing as defined above.

Single and double action pressing may be defined as follows: Single action occurs when one punch presses and the opposing punch remains stationary during the pressing period of the press cycle. We have double action when each punch moves and compresses powder at some time during the pressing period. Fig. 3 illustrates these definitions.

The die mounted in the press in Fig. 2 is a die for molding a cylindrical component with a hole whose axis is parallel to the axis of pressing. This die is probably the simplest type of molding die, and could only be simplified even more by omitting the core pin, thereby pressing a cylinder.

The press and die operate as follows: (In the following description, position numbers correspond to circled numbers on the timing chart, Fig. 4). The filler shoe arm (P-16) moves back causing the filler shoe (P-14) to swing around on the filler shoe pivot pin (P-13) until the opening in the bottom of the filler shoe is over the die (D-1), position 1.

The filler shoe then oscillates back and forth on the pivot pin in a series of short intermittent movements. The opening in the filler shoe remains over the die cavity all through the shaking period, position 2. The shoe is then drawn back to its rest station, position 3. This shaking of the filler shoe causes the powder in the shoe and hopper (P-15) to flow into the die more readily.



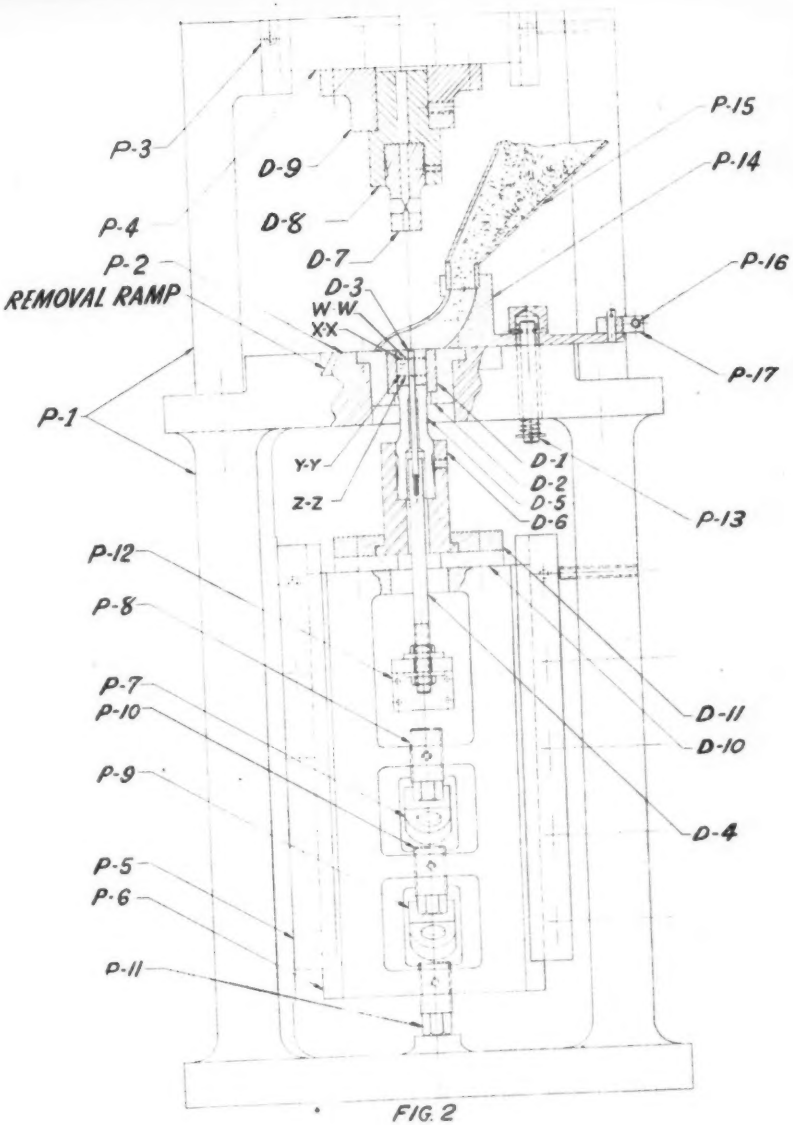


FIG. 2

P-1 Press Frame
P-2 Die Table
P-3 Upper Ways
P-4 Upper Ram
P-5 Lower Ways
P-6 Lower Ram
P-7 Ejector Lever
P-8 Ram Ejection Stroke adjusting Screw
P-9 Lower Pressure Lever
P-10 Lower Ram Pressure Stroke Adjusting Screw
P-11 Fill Adjusting Screw
P-12 Stationary Bracket
P-13 Filler Shoe Pivot Pin
P-14 Filler Shoe
P-15 Hopper
P-16 Filler Shoe Lever
P-17 Filler Shoe Lever Adjusting Link

The Die parts are:

D-1 Die Barrel
D-2 Die Adapter
D-3 Core Pin
D-4 Core Pin Adapter
D-5 Lower Punch
D-6 Lower Punch adapter
D-7 Upper Punch
D-8 Upper Punch Adapter
D-9 Upper Punch Main Adapter
D-10 Lower Punch Support Plate
D-11 Lower Punch Holder

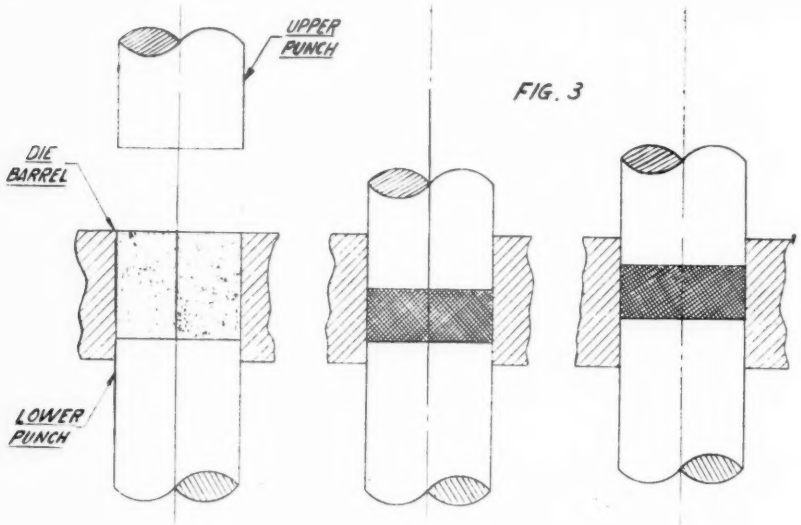
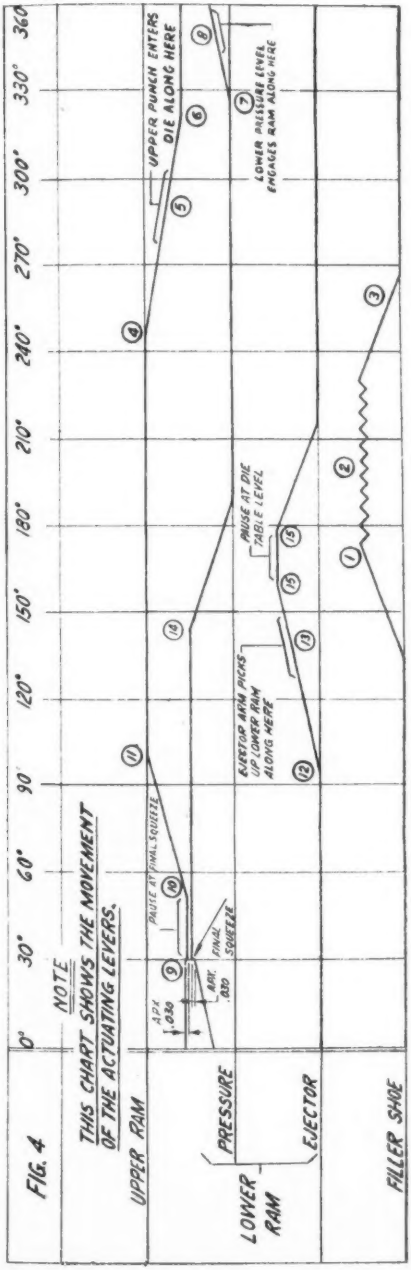


FIG. 3

As the filler shoe approaches the rest station, the upper ram starts its downward movement, position 4. Position 5 on the timing chart shows the point at which the upper punch (D-7) enters the die. The exact time at which this occurs is dependent upon the effective length of the upper ram and upper punch combination (which is adjustable and is varied to suit the depth to which the upper punch must enter the die). At position 6, the upper ram has completed its downward movement for the time being. Line W-W shows the position of the bottom surface of the upper punch at this time. The powder charge in the die has now been partially compressed. Just after the upper ram stops its downward stroke, lower pressure lever (P-9) starts its upward movement, position 7, and carries the ram and lower punch (D-5) upward until the top surface of the lower punch is at line Z-Z, thus compressing the powder almost to its finished molded shape. The point at which the ram is picked up by the lower pressure lever, position 8, is determined by the setting of the lower ram pressure stroke adjusting screw (P-10), which is adjusted to suit job conditions.

At position 9, both punches move simultaneously for a last final squeeze and the tablet is molded. Lines X-X and Y-Y show the final positions of the punches. Each punch moves about .030" for this last squeeze. The position in the die at which the tablet was molded is varied by means of the adjustments on the ram to suit job conditions. At this point, it will be well to mention the fact that not all presses operate with this final squeezing action; others have one continuous stroke for each punch.

Both rams remain in the final pressing position for a short pause until position 10, at which the upper ram starts to move up, away from the die and reaches its rest station at position 11. Ejector lever (P-7) now starts its upward travel at position 12, and engages the lower ram, position 13, which has remained at pressing position all through the upward travel of the upper ram. A short time after the ejector lever makes contact with the ram, the lower pressure lever starts to move downward to its rest station, position 14. As the ram moves upward, the compressed tablet is pushed up out of the die by the lower punch, until, at position 15, the top of



the punch is at die table level, and the molded piece is completely out of the die.

As the lower ram was moving upward on the ejector stroke, the filler shoe had started to move around the pivot pin, and just after the tablet arrives at die table level, the edge of the shoe makes contact with the tablet and pushes it onto the removal ramp. The moment at which the filler shoe arrives at the die cavity is controlled by changing the effective length of the filler shoe lever (P-16) by means of the adjustment link (P-17).

As the filler shoe goes into its oscillating movement over the die cavity, the ejector arm starts back towards its rest station, position 16, causing the lower ram to move downward, thus allowing powder to fall into the die above the receding lower punch. The depth of the fill is controlled by the adjustment of the fill adjusting screw (P-11). The molding cycle has now been completed.

The time taken for the entire cycle varies with the job. The press is equipped with a variable speed transmission, and for the sake of production, is run as rapidly as possible. Factors limiting the speed at which the press can operate are die contour, material being pressed, complexity of the die, size and shape of the component to be pressed, etc. The component shown in Fig. 5 was pressed at the rate of nine hundred pieces per hour. On some very small presses, pressing simple pieces, as many as three or four thousand cycles can be made in an hour.

The press in Fig. 2 could be adjusted for single action pressing by adjusting the lower ram pressure stroke adjusting screw (P-10) high enough so that the lower pressure lever cannot contact it.

As stated before, the press which has been described is a simple type. Many of the presses used at present for metal powder molding are machines which were designed for tableting of pharmaceutical products and simple molding of other powder materials. These materials did not require very high pressures to form them into compact masses and in many cases a binder was mixed into the powder. Consequently, when working with the comparatively high pressures required for briquetting metal powders, we find that in the case of these old machines, the pressure capacity is not

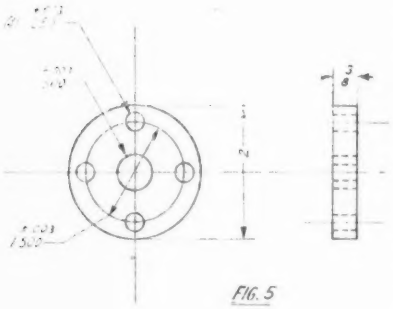


FIG. 5

consistent with the size capacity. With the recent impetus given to the metal powder industry by the war, presses have begun to appear which handle all sizes of metal powder tablets. These presses are not only built heavier, but also have some complex movements added to them in the form of additional rams operated by independent cams, powder filling devices which help to fill the die more uniformly, side core carriages, etc. These additional movements make it possible to mold components of complex proportions that could not be molded very successfully on a simple press.

The pressure required to briquette the tablet will depend on the material, grain size, lubricants in the powder mix, results desired, etc., and can run anywhere from ten thousand to one hundred thousand pounds per square inch. In the laboratory, tablets have been briquetted at even higher pressures.

Die and Product Design Consideration

It can be seen therefore that the molding dies are subject to tremenduous stresses. They are also subjected to a great deal of abrasive action. Therefore, the use of any material but hardened tool steel for the dies is practically precluded. There are exceptions and for dies used in low pressure work, case hardened steels can sometimes be used. If a case hardened steel is used care must be exercised against accidentally briquetting a piece under very high pressure while setting up the die.

In most cases the briquetted piece will change size during the sintering process. The rate of change is called the shrinkage factor and can be positive or negative. The amount and direction of change must be determined by laboratory tests for each individual job before a production die is designed, as no die dimensions can be specified until these factors are known. For example, if a circular tablet, two inches in diameter, was to be briquetted, using a material with a shrink factor of .005, the diameter of the die would be 1.005 times 2.000 equals 2.010. All other dimensions on the piece to be molded would be increased in the same manner. In some cases the shrink factor along the axis of pressing will be different than the shrink factor along an axis perpendicular to the axis of pressing.

The compression ratio is the ratio of the height of the powder charge in the die to the height of the molded piece. It will vary with the density required, material being pressed, grain size, lubricants, etc. The ratio is determined in the laboratory, and is used for designing the die. It is given approximately and does not have to be more accurate than a quarter of a unit, unless the size of the component is such that the press chosen for the job will have to operate in the range of its maximum stroke.

Lateral Flow and Powder Distribution

One of the basic problems of powder molding is the matter of lateral flow under pressure. By lateral flow, we mean flow along the axis which is lateral with respect to the axis of pressing. Metal powder has very little lateral flow. Therefore, when molding components which vary in dimensions along the axis of pressing, it is necessary to compensate for the different levels of the part by varying the amount of material deposited in the different sections of the die.

To illustrate this point, let us consider the component shown in Fig. 6, which is a small circular piece of two levels. We will assume that the material and density requirements, etc., are such that the compression ratio becomes 2.5. Let us attempt to mold this part in the die shown in Fig. 7. Since the overall height of the tablet is ¼" it will be necessary to fill ⅝" of powder into the die cavity in order to properly briquette the center portion of the piece, Fig. 7, A. The pressed tablet is shown in Fig. 7, B. The center portion has been pressed to the required density, but the flange of

the tablet has been pressed to a much higher density (in this case twice that of the center section) because the same depth of powder charge has been pressed into a smaller space. If the material had sufficient lateral flow, powder from the center section would have flowed under pressure into the flange section in order to equalize the density. In such a case, the depth of the powder charge would have been two and one-half times the volume of the tablet divided by the area of the die cavity or depth equals 2.5 V.

A

However, no such flow under pressure, as described, occurs during the briquetting period because the powder has a small amount of lateral flow; this is a function of the material, amount of lubricant, if any, in the powder mixture, shape of the die and punches, etc. In many instances, overpressing such as occurs in Fig. 7, B, would break the punches.

In order to press the component in Fig. 6, we turn, therefore, to the die shown in Fig. 8. In this die, the flange of the work piece is formed on a separate sleeve which is screwed into the case which holds the main die barrel. The inside diameter of this sleeve serves as a die barrel for the small diameter of the component. The screw thread on the base of the sleeve serves as a means of support and provides adjustment of the depth of powder charge for the flange section. The sleeve is locked in position by a flat lock screw with spanner holes in its body. The depth of powder charge for the center section of the component is adjusted by means of the fill adjustment screw on the press. Therefore, the depth of the powder charge for each section of the die, corresponding to the different sections of the component can be varied independently. Note that with this type of adjustable die for a flanged piece, the position in the main die barrel at which the component is molded is determined by the depth of powder charge necessary for proper molding of the flange. This factor is objectionable in some cases, and other types of dies have to be used when these objections arise.

Where the differences in height of the various levels on a component are very slight, it is not always necessary to compensate for the corresponding differences in depth of powder charge by mechanical means. Lubricants can sometimes be added to the powder mixture to increase the amount of lateral flow present in the material. These lubricants burn away during sintering hence they do not affect the nature of the material but do affect its porosity or density. For precision work, it is not advisable to depend upon lubricants for overcoming small dimensional differences in a component, as a variation in density within the briquetted piece means a variation in the shrinkage factor and could cause warping during the sintering stage.

Die Design: Simplicity vs. Cost

When designing a die, one of the first factors to be considered is the quality of pieces to be molded. Sometimes, if the production is to be small, a great deal of die cost can be saved by substituting a machining operation and a simple molding die for a more complicated die. A simple die can usually be set up and put into production with a minimum amount of adjustment, whereas a complicated tool may require many test runs and much experiment before satisfactory pieces are pressed. But the die designer should not bend over backwards in an effort to achieve simplicity. In many cases, an additional die cost will be justified by a better tablet. One hundred per cent molding of a component should be the objective unless the design of the piece is such that the inherent limitations of the briquetting process will prevent attaining it. Even then, remember that some of the heretofore inherent limitations of the briquetting process have been overcome by ingenious die design.

Experience has shown that every little

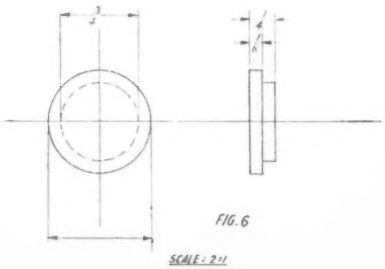


FIG. 6

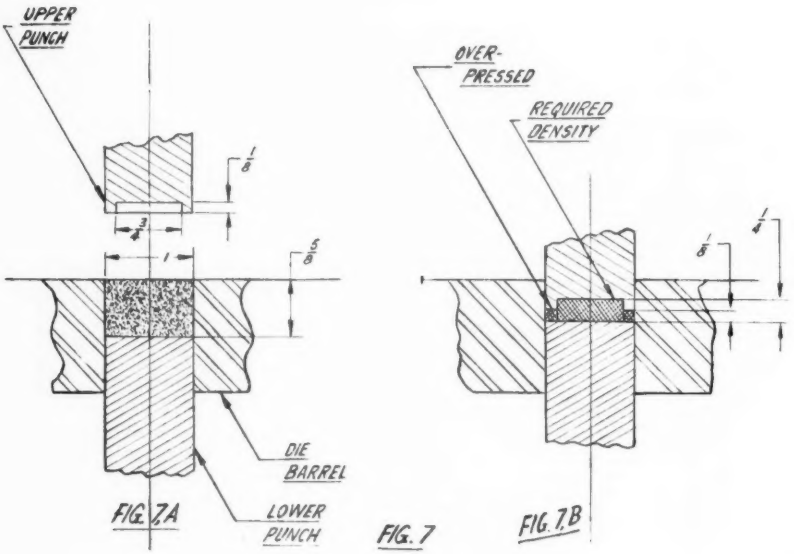


FIG. 7

difference in the geometry of a piece poses a problem. A little ear or lug sticking out of the side of a piece may necessitate a complicated die to permit proper ejection of the tablet, whereas without the lug, the piece might be molded in the very simplest of dies.

Press Selection

When selecting a press on which a job is to be run, many considerations have to be taken into account. Naturally, the work schedule of the press is a prime consideration, as with any manufacturing machine. It is always best to stay well within the pressure capacity of the press. The press speed is another factor, a factor which weighs heavily in the case of very high production jobs. However, these considerations might be pushed aside immediately by the design of the component, which might be of such complexity or size that a press with multiple rams or one with a very high pressure capacity is necessary. All phases of the job must be carefully analyzed. Even after a press is selected and the design of the die begun, certain elements of die construction may make necessary a change of presses.

Experience should be looked to for reference, but not for decision, as each component will have its own peculiar problems. A small round tablet with one-half square inch of face surface area might be made on a simple press, say of twenty tons capacity. A slightly larger diameter tablet with a square hole in it, which reduced the face surface area to one-half square inch, might require a larger press, or a special die, in order to properly fill the die cavity.

One very important consideration which is very frequently overlooked, is the matter of sidewall friction. This presents a great variety of problems in pressing to uniform densities and in ejecting molded tablets from the die. Where we have any appreciable length of tablet along the axis of pressing, these problems are usually prominent. The resistance to ejection caused by sidewall friction can be unbelievably high. One case occurred where a tablet was molded in the die very easily, the press making a very gentle bumping sound at the final briquetting action, indicating that the machine was operating well within its pressing capacity; yet the ejector linkage broke when the ejection cycle started. This was caused by a very large sidewall surface area on the component, which was due to a highly

irregular contour and a great length along the axis of pressing.

In another case, a long tablet was molded around a core pin of comparatively small diameter. Upon ejection, the core pin pulled apart in tension, the upper broken piece being ejected with the tablet. It is very important when designing dies with special ejection motions, that the parts be designed with this point in mind.

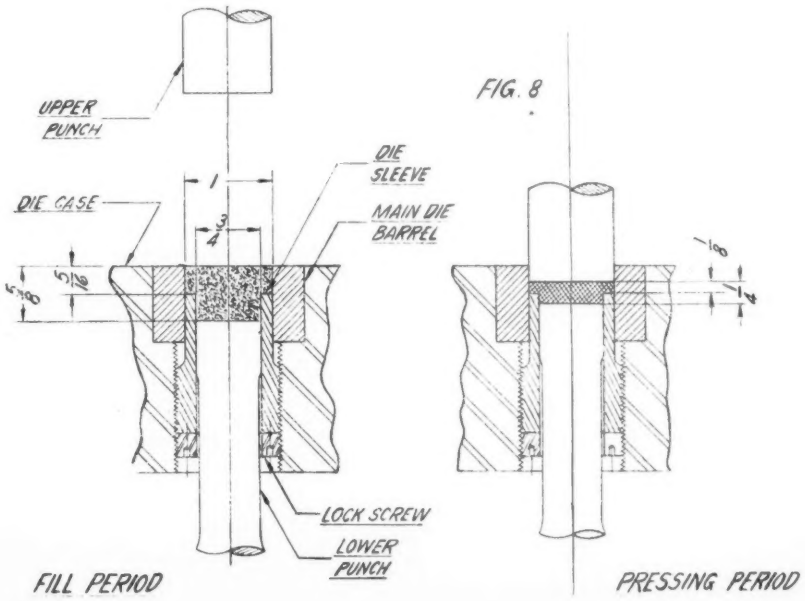
The density problems connected with molding tablets of any great length are more of a headache, however, than the ejection problems. When tablets of appreciable length are molded, the sidewall friction tends to retard uniform briquetting along the axis of pressing and there will be a less dense section within the body of the tablet. If complete double action is used, the area of lowest density will be approximately midway along the axis of pressing. If single action is used, the end nearest the stationary punch will have the lower density.

Lubricants help a great deal to overcome this problem. Also some very ingenious dies have been designed to counteract sidewall friction. Filling the die cavity is another major problem. Intricate contours on a piece sometimes cause a great deal of experiment in die positioning. Deep dies and dies with many segments and sleeves in them are difficult to fill uniformly.

Another point which can never be stressed too greatly is safety. Many pieces with delicate edges and contours require that an attendant be present at the press to remove the tablet as it is swept away from the mouth of the die toward the removal ramp by the filler shoe. With the pressure necessary for briquetting metal powders, it is very possible for steel to fly if poorly stressed die parts are overloaded; or a poorly designed upper punch adapter could come out of alignment with the die and cause a shattered punch. For safety's sake, think of the press operator when designing a die.

It becomes more and more apparent, therefore, that the design of a molding die involves a great deal of thought and analysis. A record book of previous dies is an invaluable aid. The complete history of each new die should be recorded, and it should be followed up, even after it is in regular production.

FIG. 8



TWIST DRILL DATA FOR THE DESIGNER

C. W. Hinman
Designing Engineer

TOOL designers and shop men should know how twist drills are made and why they are so made. They should appreciate the great accuracy of drills and how they perform. The diameters of commercial twist drills are ground and lapped to absolute size and are correct to the fourth decimal figure. Over 750 different diameters comprise all the number and letter sizes, common fractions and millimeter dimensions. Drills are made for all these sizes from both carbon or high speed steels, and many of them can be had with left hand spiral. Most commercial drills have short straight shanks, but they are also available with long shanks and the larger sizes with bit stock shanks, straight shanks, taper shanks with tangs, ratchet shanks, and with blacksmith's shanks.

Drill manufacturers agree that the included angle at the end of the drill, formed by the lips of the cutting edges, should be 118°, or 59° on each side of the axis of the drill, as shown in Fig. 138. Standard twist drills of two flutes are made by milling one spiral groove or flute in opposite sides of the drill blank, and the depth of cut decreases so that the two cuts terminate or blend with the O. D. at the shank. The metal that remains between the bottoms of the cuts is called the "web." The web thickness increases gradually toward the shank because, as just stated, the cutting depths of the flutes decrease throughout their lengths. The web, in revolution, is a core that tends to increase the torsional strength of the drill body.

The correct size of a new drill is the diameter across its margins, or "heels" as shop men call them, but the diameter tapers to a slightly smaller size from the heel throughout the length of the body. This feature provides the necessary body clearance when drilling deep holes. For measuring the size of a twist drill it is safer to take the diameter from heel to heel across the margins. To measure the shank diameter is not a reliable procedure because of the back taper just described.

Twist drills are the most efficient of tools. Fully fifty percent of the metal in the blank is removed when milling the flutes, yet the drill will take more stress and abuse in proportion to its strength than any other type of metal cutter. The obvious reason for this is that a drill is supported by the metal upon which it operates and because its cutting lips are closely confined within the work.

The spiral flutes serve four purposes.

1. They help to form the proper cutting edges of the cone-shaped point.
2. At their junction with the cutting edges the resultant shape curls the chip tightly so that it occupies minimum space.
3. The flutes also serve as channels through which the chips escape from the hole.
4. The flutes permit lubricant and coolant to flow down to the cutting edges.

The dead center is that sharp edge across the web at the extreme tip end of the drill. It is formed by the intersection of the cone-shaped surfaces at the point. It should always be in the exact center of the drill. In order to give a real cutting edge to the lips, the surface of the cone is ground away or relieved just back of the edges of the lips. Improper grinding of the lip clearance is a frequent cause of breaking the drill and of drilling oversize holes. This clearance relief of the cutting edges must be exactly symmetrical as to both lips.

When we consider all these conditions and the exact nicety that must be observed in grinding drill points for doing efficient work, it is no wonder that even a professional toolmaker cannot grind a drill point truly symmetrical, free-hand and by eye. Drill points should be ground in a precision drill grinding fixture of which several good ones are on the market. Drill grinders are usually set up in the tool crib and an experienced man does the sharpening when drills are returned from service in the shop.

Referring again to Fig. 138, the height, *P*, from the dead center point to the heel on any standard drill is .300 times the drill diameter. This is a dimension often needed for spotting approximate diameters, countersinking, and for feeding drills to predetermined depths in automatic screw machines. When the included angle of a drill is 90° for drilling Bakelite, Ebonite, and similar materials, height *P* is then .500 times the drill diameter. These formulas give approximate heights but they are sufficient for all practical purposes.

Grinding Drill Points

Fig. 139 shows nine different drill points as ground for efficient drilling of various materials. At *A* is the regular standard point of 118° included angle for drilling mild steels and for general shop use. At *B* is a notched crankshaft point for drilling moderately deep holes. At *C* is a drill point of 140° included angle for hard steels. At *D* is a double angle point for drilling cast iron. At *E*, an ordinary thinned point for shop use. At *F* is a drill point of 118° included angle, but relieved for drilling brass. It will be noticed here that the "hook" is removed. At *G* is a 90° included

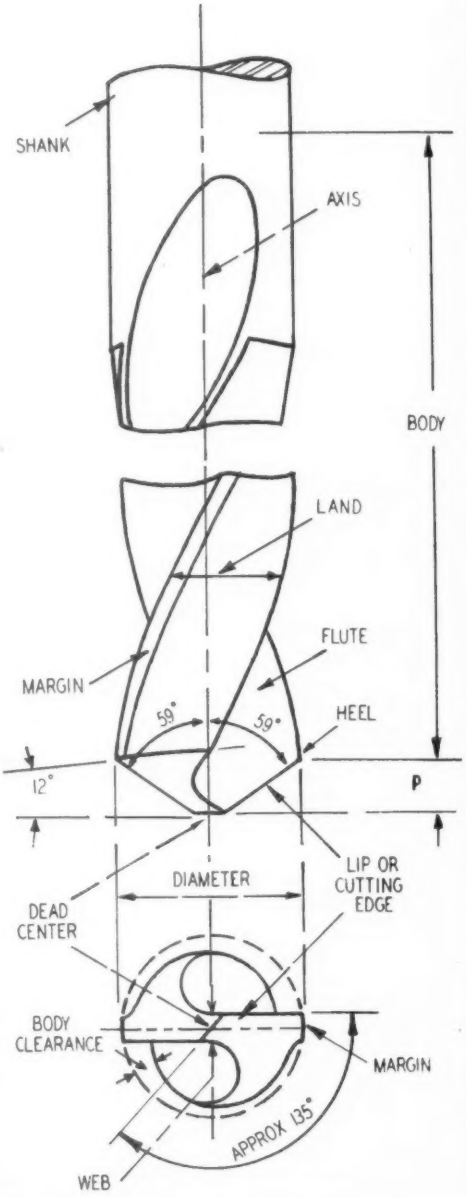


Fig. 138 — Design features of standard twist drill point, body and shank.

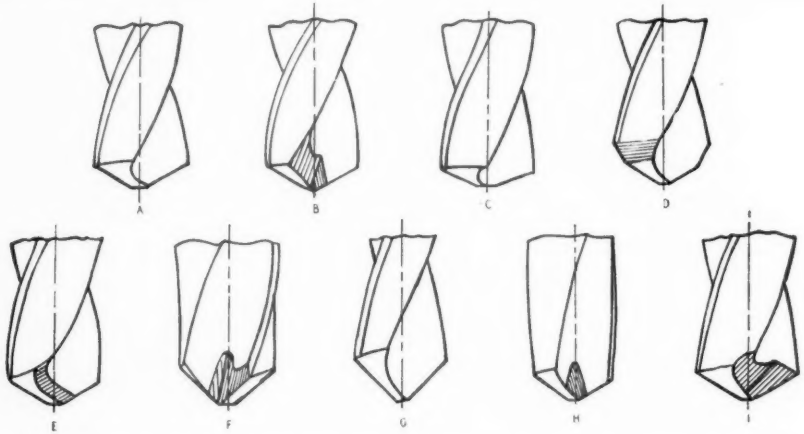


Fig. 139—Standard and special drill points as ground for drilling various materials.

angle for drilling Bakelite, Durez, Micarta, hard fiber, Ebonite, and similar materials. At *H* is a drill point ground for drilling very hard steels. At *I* is an undercut thinned point largely used for drilling steel forgings.

Combination Drills

The blanks used for making combination drills, Fig. 140, are turned from one solid piece of tool steel. These drills are of two commercial varieties, the plain combination type shown at *J*, and the dual cut type at *K*. When drilling holes of such diameters and shapes as shown in the sketch, it is quite often possible to drill and complete the job in a single operation by using such combination or "step" drills. These drills can be successfully guided by drill bushings only if the larger diameter fully enters the bushing before the point contacts the work. This is apparent in Fig. 141.

Referring again to Fig. 140, the combination drill at *J* has one pair of margins or cutting edges shaped to cut the various diameters and chamfers required. However, when the countersinking portion of the tool needs resharpening, the grinding wheel usually cuts into the smaller diameter of the drill, and after several regrinds the tool must either be discarded or reground completely. On the other hand, in the dual cut type shown at *K*, each diameter has its own set of margins running the full length of the flutes. In this type of tool it is possible to regrind the shoulder without touching the margins of the small diameter. This feature means that the drill can be successively repointed until entirely used.

Entering Drills in Jig Bushings

Drill jigs should always be placed against positive stops secured to the drill press table. Particularly when the jig is small and the drill comparatively large, the stops prevent torsional movements of the tool. In other words, positive stops prevent small jigs from revolving with the drill. When the jig has a definite location and is thus properly aligned under the drill, it is easy to enter the drill into the bushing as shown at *L* in Fig. 143.

Some plants still employ the old idea of making the drill bushing entrance 118° included angle as seen at *M*. They believe that, because the included angle of drill points is 118°, if the drill enters the bushing a trifle out of line, the cutting edges will contact a parallel surface on the bushing entrance and that this will avoid dulling the drill. However this is not true in practice. When a drill enters a bellmouthed bushing a trifle out of line, the drill will be aligned more quickly and with less resistance as shown at *N*, than in the condition at *M*.

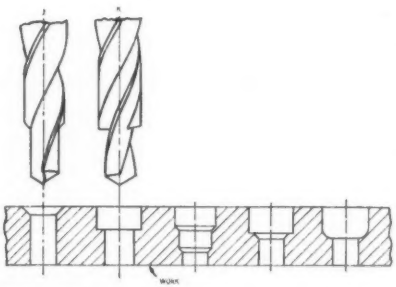


Fig. 140—Types of holes produced by using one-piece, combination drills.

Another favorable condition at *N* is that the heels on the drill are protected from dulling by the smooth radial entrance around the mouth of the bushing. On the other hand, at *M* the sharp corners on the heels must contact another abrupt corner around the countersunk diameter in the bushing which increases wear at the corners of the heels. Commercial drill bushings are made with bellmouthed openings. Visualizing such practical working conditions as these and providing for them indicates an efficient tool designer. Tool engineering is largely common sense plus accumulated experience and without exercising these attributes a designer may be led into many errors of design.

Drilling Speeds

Drills which are run at a too high speed to suit the material being drilled will become dulled first at the heels. This is because the circumferential travel of the heels, in feet per minute, is too fast for cutting that particular material. The circumferential travel, *C*, in feet per minute for a drill is found by multiplying its diameter, *D*, in inches, by

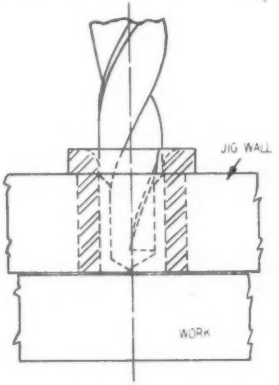
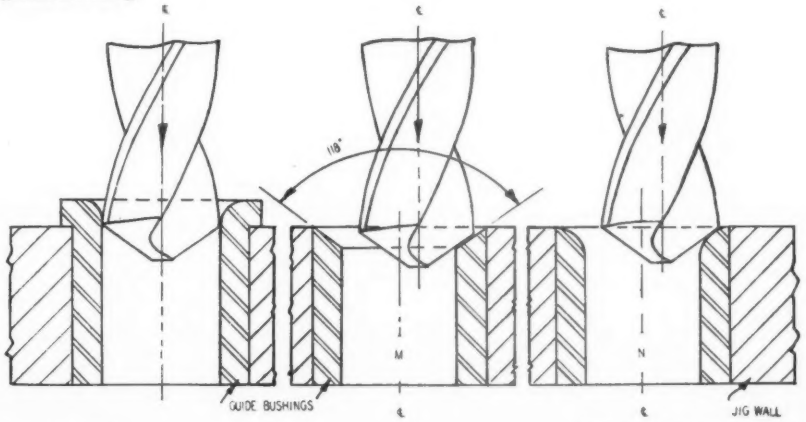


Fig. 141 — Illustrating the conditions governing the guiding of combination drills through drill bushings.

the rpm times .262. The factor .262 is a constant and rpm is the spindle revolutions per minute of the drill. Stated in a simple formula: $C = D \times \text{rpm} \times .262$, therefore:

$$\text{rpm} = \frac{C}{D \times .262}.$$

Fig. 142—Showing the conditions that prevail as a drill enters the mouth of its guide bushing.



The following table gives the suggested cutting speeds in feet per minute for high speed steel drills:

	F.P.M.
Cast Iron, Hard	70 -100
Cast Iron, Chilled	30 - 40
Malleable Iron	80 - 90
Magnesium and Its Alloys	250 -400
Monel Metal	40 - 50
Steel, Machinery, .2 to .3 C	80 -110
Steel, Annealed, .4 to .5 C	60 - 70
Steel, Tool, 1.2 C	50 - 60
Steel Forgings	50 - 60
Steel, Alloy	50 - 70
Steel, Stainless, Free Machining	60 - 70
Steel, Stainless, hard	30 - 40
Bronze, Brass, and Copper Alloys	250 -300

Carbon steel drills should be run at speeds of about 40 to 50 percent less than those given for high speed steel drills.

Example: If a ¼" diameter hole must be drilled in a steel forging and a high speed steel drill is to be used, we refer to the table of suggested speeds and take an average of the recommended speeds for drilling steel forgings, which is 55 feet per minute. Using the formula previously given to get the correct rpm, we have the following:

$$\text{rpm} = \frac{55}{.250 \times .262} = 840.$$

If the drill to be used is of carbon tool steel, use half of 840 or 420 rpm.

For multi-diameter drills the largest diameter is obviously the one that must be used to determine the proper number of revolutions per minute for drilling any material.

Handbooks, catalogs and "slide rules" furnished by various drill manufacturers give exhaustive tables of spindle speeds, feeds and cutting feet per minute for many materials, and using them avoids figuring each application.

Feeds Per Revolution of Drill

Safe feed per drill revolution is governed by size of drill and the kind of work material. Feeds per revolution are the same for both high speed and carbon steel drills in a given material. High speed steel drills will produce holes more quickly because they will "stand up" when run at twice the rpm of carbon steel drills. A good rule is to use a feed of .001" to .002" per revolution for drills of less than ⅛" diameter. Use a feed of .002" to .004" for drills ⅛" to ¼"; .004" to .007" for drills ¼" to ½"; .007" to .015" for drills ½" to 1" and .015" to .025" for drills larger than 1".

Drilling Lubricants and Coolants

It is good practice to refer special lubrication problems to a reputable manufacturer of cutting oils and coolants. The following list of lubricants should be considered as general suggestions applicable to most ordinary drilling jobs:

Aluminum and its alloys: soluble oil, kerosene and lard oil compounds, light non-viscous neutral oils, kerosene and soluble oil mixtures.

Brass: dry, soluble oil, kerosene and lard oil compounds, light non-viscous neutral oils.

Copper: soluble oil, winter strained lard oil, Oleic acid compounds.

Cast Iron: dry, or with a jet of compressed air for a cooling medium.

Malleable Iron: soluble oil, non-viscous neutral oils.

Monel Metal: soluble oil, sulfurized mineral oils.

Steel, ordinary: soluble oil, sulfurized oil, high E. P. value mineral oils.

Steel, very hard and refractory: soluble oil, sulfurized oils, or turpentine.

We are indebted to the Cleveland Twist Drill Co. and The Cogsdill Twist Drill Co. for some of the data presented by Mr. Hinman. Ed.

ACCURACY AND THE GEOMETRY OF PRECISION

Part II*

E. Willard Pennington
TECHNICAL EDITOR

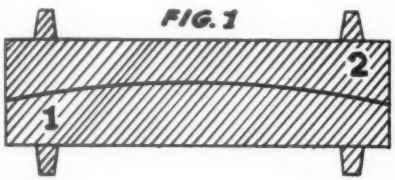
THE method of making truly flat surfaces as invented by the pioneer English engineer, Sir Joseph Whitworth, and announced by him in 1840, is believed to have been introduced in the United States in the 1850's.

As applied to making or originating master surface plates, (without any reference to, or dependence on, work previously done) the method requires three surface plates. The plates should be rough machined, normalized to relieve casting and rough machining stresses, and then very finely finish machined to leave as little tool mark pattern as possible. The plates must be plainly labelled, #1, #2 and #3. They are then scraped, one to another, in the following systematic rotation:

First Round: Plates #1 and #2 are scraped to each other, blueing first one and then the other in order to uniformly remove toolmarks and any other surface imperfections. It is not necessary to continue this scraping beyond the point where plates #1 and #2 show reasonable agreement. It will be obvious that plates #1 and #2 can be in agreement even though one may be slightly concave and the other equally convex (Fig. 1). In other words, the agreement or uniformity of contact between two surface plates is no assurance of flatness.

Second Round: Plates #1 and #3 are next similarly scraped to the same reasonable degree of agreement or similarity. During this operation however, the blueing must be applied *only* to plate #1 and metal scraped *only* from

FIG. 1

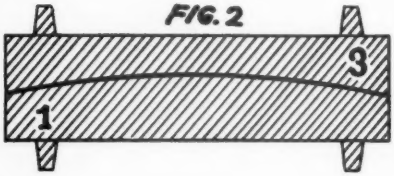


#3 (Fig. 2). By using plate #1 as the "control" plate we are assured that plate #3 becomes an exact duplicate of plate #2, equally concave or convex as the case may be. By now the process has brought about the following condition: Plates #1 and #2 are in agreement but not necessarily flat; plates #1 and #3 are in agreement but not necessarily flat; plates #2 and #3 are *out* of agree-

*The first part of this article appeared in the Tool & Die Journal, November, 1943.

ment by twice the amount that #1, the "control" plate, is either concave or convex (Fig. 3). The next step, that of *reducing* the disagreement between plates #2 and #3 becomes the

FIG. 2



Third Round: wherein plates #2 and #3 are scraped to agreement by alternating the application of blueing to one and then the other so that each gets scraped approximately the same amount and so that the resultant error of each (Fig. 4) is less than at the beginning of the Third Round. Note that plates #2 and #3 have been brought to agreement and, that by the approximately equal scraping of each, their agreement or pattern of contact is an error of lesser magnitude than at the beginning of the Third Round. However, there is still no assurance of flatness. Now that plate #2 is in lesser error than before, it is used as the "control" plate for the

Fourth Round: in which plate #1 is brought into agreement with plate #2 by scraping metal *only* from plate #1.

FIG. 3

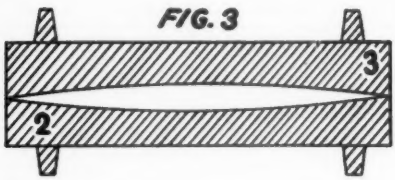


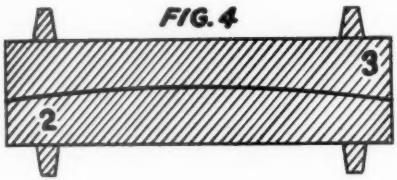
Plate #1 now has less error than it had before.

Fifth Round: Plates #1 and #3 are next scraped to agreement, and note that this time, as compared to the Second Round (the last time that plates #1 and #3 were brought to agreement), the scraping is applied equally to the two. Therefore their agreement is a closer approach to a flat surface by virtue of the reduction in error. The error in plate #3, having thereby been reduced, in the

Sixth Round: plates #3 and #2 are scraped to agreement. This time, instead of scraping metal from both, as in the Third Round, the scraping is applied only to plate #2 so that its error will be reduced to that of plate #3.

It must be borne in mind that each time any two plates are brought into agreement, the opposite procedure is followed than when those same two plates were previously scraped. In other

FIG. 4



words, if, when two plates are brought into agreement by removing metal from each, the next time when those two plates are scraped, the one with the lesser error must be used as the "control" plate, in order that the greater error may be reduced to the lesser. By the same token, the *next* time those two plates are brought into agreement, the scraping will be equally divided.

This is the order of scraping that must be followed until all three plates are in mutual agreement or fully interchangeable, i. e., when two of the three plates register perfect agreement (two things that are equal to the same thing, are equal to each other).

It might be argued that this process of Whitworth's is a never ending one, and that perfection could thereby never be attained, but only approached. Physically and mathematically it represents a rapidly converging series and, after a relatively few rotations thru the cycle the plates will have assumed a flatness in which there is no measurable error.

In his highly interesting style, Halsey

offers this startling, but true, thought: "It will be observed that this is a perfect illustration of the definition of precision work, as the result obtained is in no way dependent upon anything previously done. Given a scraper and a pot of paint, it might, if necessary, be done in the wilderness with just as good final results as if done in the best machine shop in the world!"

Straight edges are no more or less than long and narrow surface plates. Master straight edges are made or generated in exactly the same way as master surface plates, in accordance with Whitworth's procedure.

When made in this fashion, they embody Dr. Sweet's classical definition: "A perfect straight edge is one of three, any two of which, when placed together, coincide throughout their length."

Paraphrasing, we may say, therefore, that: a perfect surface plate is one of three, any two of which, when placed together, coincide throughout their surface.

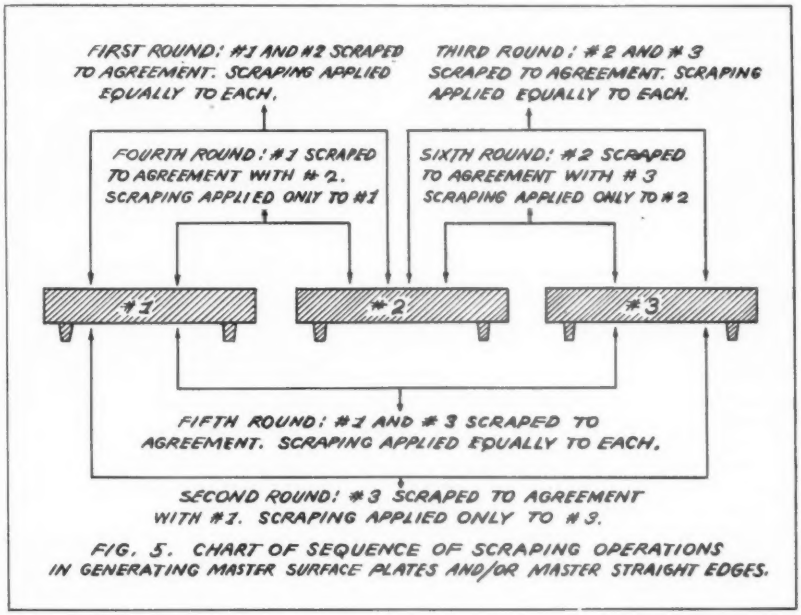
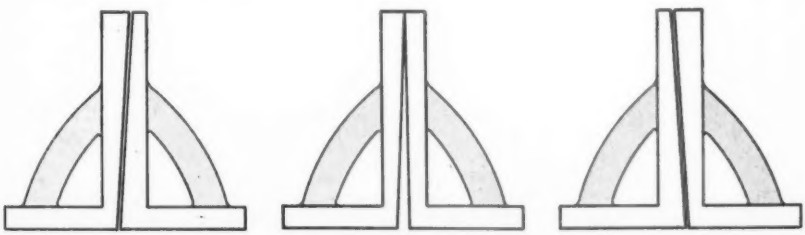

FIRST ROUND: #1 AND #2 SCRAPED TO AGREEMENT. SCRAPING APPLIED EQUALLY TO EACH.
THIRD ROUND: #2 AND #3 SCRAPED TO AGREEMENT. SCRAPING APPLIED EQUALLY TO EACH.
FOURTH ROUND: #1 SCRAPED TO AGREEMENT WITH #2. SCRAPING APPLIED ONLY TO #1
SIXTH ROUND: #2 SCRAPED TO AGREEMENT WITH #3 SCRAPING APPLIED ONLY TO #2
#1
#2
#3
FIFTH ROUND: #1 AND #3 SCRAPED TO AGREEMENT. SCRAPING APPLIED EQUALLY TO EACH.
SECOND ROUND: #3 SCRAPED TO AGREEMENT WITH #1. SCRAPING APPLIED ONLY TO #3.

FIG. 5. CHART OF SEQUENCE OF SCRAPING OPERATIONS IN GENERATING MASTER SURFACE PLATES AND/OR MASTER STRAIGHT EDGES.



WANT TO WIN A WAR BOND?

or

How Would You Lick This Cutting-Off Problem?

WE recently received the following inquiry:

"We are manufacturing a cam roller, the completed dimensions of which are 1⅝" diameter by a 1" hole. These are cut from aluminum bronze rods 1¹⁵⁄₁₆" diameter, hot rolled. The material Rockwell's C34 to 40 and its chemical analysis is approximately 82% copper, 14% aluminum and 4% iron.

"These cam rollers are roughed out on our hand screw as well as our automatic screw machines. Now then, our difficulty is with our cutting-off tools which continually chip and break off because of the hardness of the material.

"We have tried high speed steel cutting-tools, as well as diamond cutting-tools and we have now switched to carbide tools—all giving us the same trouble.

"These tools not only chip and break themselves, but very often the force of contact will also snap the tool which has been welded on to the holder.

"Is there a tool on the market that will eliminate this problem, namely, a tool that will not chip or break off, or is there a process a cutting-off tool can be put through that would guard against its chipping and breaking off?"

In gathering the data incorporated in our response to this request we were impressed by the great interest shown in cutting-off operations and the extent of "causes and cures" that were recited.

Realizing that many of our readers possess the necessary "know-how" to lick such a problem and that many others would benefit by an article treating this subject we are offering the following prizes for the five best and most comprehensive answers to the above quoted inquiry:

First Prize: A $25 War Bond
Second Prize: $10 in War Stamps
Third, Fourth and Fifth Prizes: each, The Tool & Die Journal for one year.

The contest rules are few and simple:

1. Your answer must be original and of *at least* 800 words.

2. Drawings or sketches are helpful but not compulsory.

3. Your answer must be addressed to:
Contest Editor, Room 309
The Tool & Die Journal
2460 Fairmount Blvd.
Cleveland 6, Ohio

4. Your answer must be postmarked *not later than* Feb. 15, 1944.

5. Your answer must bear your *signature*. Then, additionally, *print* your name, correct job title and company, and your *residential* address.

6. All answers will become the property of the Tool & Die Journal—will not be returnable—and will be judged by the T & D J Editorial Staff whose decision will be final.

What could be simpler? It's up to you now to sit down and think about the mean cutting-off operations you've battled and then tell us how you'd lick this one!

Yes, we realize that for diagnostic purposes you'd like more information on which to base your "cure"—such as speeds, feeds, dimensions and type of tool (circular or flat), machine condition, coolants, etc., etc.,—there being no such thing as too much or too detailed information for diagnostic purposes. However, we have given you all the information that we, in turn, were given.

We receive many such inquiries and many of them involve highly interesting and informative problems and case histories. If this contest creates sufficient reader interest we will be glad to make it a monthly feature. We'll furnish the questions and prizes if you'll furnish the answers! Fair enough?

All winners will be announced in an early issue of the Tool & Die Journal.

E. W. P., Tech. Ed.

INDUSTRIAL PLASTICS

The Hardboard Industry and America's Future*

"If evidence is needed to refute the pessimistic view that American resources are drying up and that we, as a nation, have reached the peak of our industrial expansion, one need only look at the record made during 1943 by an industry that did not even exist 20 years ago—the hardboard industry.

"Even before America's entry into the war, and the consequent demand for greater production of all kinds, hardboards and pressed woods were filling many needs in industry, as well as in the building and construction trades. Today, hundreds of manufacturers of essential war and civilian goods have turned to wood plastics, adapting them to additional uses undreamed of a few years ago.

"The great future of hardboards, however, lies not in the place they have earned for themselves in wartime production, but in peacetime adaptation of these uses and in the many new fields which American ingenuity and research will find for them in the post-war period. Hardboards have done a hard job well, and industry has accepted them, not as a temporary wartime expedient, but as tried and tested raw materials with infinite uses.

"Increasing demand for wood plastics and semi-plastic hardboards by America's war industry reached such a peak in the second year of the war that nearly all its output was diverted from prewar uses to the production of essential war and civilian goods.

"One of the first of the great industries to turn to hardboard materials was the booming airplane industry, which used the controlled plasticity of lignocellulose pressed woods to make dies for routing, forming, shearing and stamping the light metal parts used for wing and fuselage sections. Every airplane manufactured in the United States today for service on battlefronts contains thousands of parts formed on Masonite die stock.

"When restrictions were placed on the amount of metal which electrical manufacturers could use in the production of fluorescent lighting reflectors, the electrical industry turned to hardboards. Pressed wood, they found, will take a high enamel finish which produces eight to ten percent more illumination than the old type metal reflectors.

"After the war, wood plastics will again provide new opportunities for the builder of both prefabricated and conventional type homes. The same type of pressed woods that provide strength, economy and ease of fabrication for dies that stamp out parts for airplanes will lend these qualities to the construction of future houses. The same efficient insulating materials that keep military huts warm in Alaska and cool in the tropics will do the same in all types of post-war buildings as well as for many other items where it is necessary to insulate against heat and cold."

R. G. Wallace, Vice President Masonite Corporation

Additional Wartime Duties for Saran

What is believed to be one of the largest Saran parts ever to be injection-molded is a 35-ounce plating mask for use in chrome plating wartime aircraft landing gear struts. Fabricated by the St. Louis Molding Company of St. Louis, Mo., a molding cycle of only 70 seconds was required on a modified Watson Still-

man machine. This is another on the long list of wartime applications for the plastic Saran.

Because of its high chemical resistance, lightness and metal-like strength and toughness, Saran was found to be especially fitted for use as an impenetrable mask to prevent plating certain parts of landing gear and to localize the chrome treatment to the desired area. The plastic is reported to be unaffected by the highly corrosive elements of the plating solution.

Saran, made by The Dow Chemical Company, has many and varied wartime uses, perhaps the most startling of which is its application, just made public, as a transparent air- and watertight film to protect America's metal armaments from rust and corrosion in transit to the battlefronts. In so contributing to the Allied cause, Saran has done away with an old ordnance bottleneck in manpower and time. Formerly parts of machine guns and other metal ordnance were protected by a heavy coating of grease, which of course had to be carefully removed before guns could be assembled and aimed at the Axis. This was hardly a timesaver. Saran Film however, is removed as quickly and easily as the foil which used to wrap that package of cigarettes in your pocket.

★

A new translucent "skin" for protecting machine parts in shipment shows definite indications of relieving another bottleneck in the flow of new and replacement parts to the battlefronts, say Army Ordnance men.

The new packaging material, recently developed by Dow in response to an appeal from a maker of amphibian vehicles, is already saving time and manpower at home, and speeding the work of assembly and repair crews at the front. The product, which has an ethylcellulose base, is a plastic-like substance which is applied by a simple hot dip process; sets into a tough, skin-tight coat in a few seconds that fully protects the metal from rust, corrosion and dirt during shipment. Assembly crews find it strips off quickly and easily with no more equipment than an ordinary pocket knife.

Although the material used is not yet available for general distribution, being under rigid government control, production experts believe it will eventually revolutionize this entire phase of packaging procedure for civilian as well as military equipment. Previous methods frequently required the slow and laborious hand-wrapping of parts in a special grease-proof wrapping material followed by dipping in hot wax, or an alternative process of pre-coating the parts with a heavy grease which was difficult to remove in the field. These grease-coated parts likewise had to be hand wrapped before shipment.

The types of parts which can be treated by the new process are not yet completely defined. Its use is already apparent in many cases. Adaptations of method are constantly being extended under rigid military supervision. Actual production costs, ordnance men declare, already indicate packaging time reductions up to 80 percent.

So effective is the material in protecting metal from dirt, salt air and salt water, that parts may even be tossed overboard at high tide near invasion points, to be recovered later by repair crews when the tide and the fortunes of war permit.

G. E. Plastics Review

From the January 1944 issue of the GENERAL ELECTRIC REVIEW we learn that:

"During the year the GE Plastics Divisions had in use more than 3000 active molds, all of them making parts for the armed services and for essential industry. The plastics laboratory converted all its facilities to the development of materials that were critical and to the creation of plastics compounds to replace natural materials cut off by the war. Manufacturing facilities were further expanded during the year to care for the ever-increasing rate at which war-needed items were being produced.

"Low-pressure molding was one of the year's developments. By impregnating various types of cloth and paper with plastic resins and subjecting the laminations to heat and pressure, various parts with necessary requirements—high strength, light weight, and low tooling cost—were developed.

"Among the war products were the

plastics fuse cap for the M-52 trench-mortar shell and the loop-antenna housing for aircraft, both previously described. Among still other products were many plastics parts for battle telephones for warships; laminated plastics by the thousands of tons for instrument panels, switchboards and even insulating structural members for use in electrical controls of vessels; loudspeakers for intercommunication systems; parts for airplane magnetos; firing pins by the millions; gun-control parts for planes, tanks and combat ships; machine-gun parts; valves for barrage balloons; control for electrically heated flying suits; and junction boxes, switches, instrument cases, relays, connectors, radio equipment and parts for ignition systems."

1944 Plastics Catalog Gives Complete Wartime Picture

Publication of the 1944 Plastics Catalog brings up-to-date the history and achievements of plastics materials in every branch of industry. More than 1,000 pages of informative and authoritative material, to encompass the expanding scope of plastics production and development, usher into public view many new materials and new manufacturing methods.

The editors of the Catalog have selected 40 typical and important plastics developments used by the various branches of America's Armed Forces. These developments include the M-52 trench mortar fuse, the helmet liner, the raincoat and other large-scale plastic applications. Wherever possible, actual figures on time, manpower, materials, weight and money saved are given. This section alone is expected to furnish much food for thought for manufacturers in all industries who are looking for ways and means of cutting costs and expediting production. This record of wartime achievement by plastic materials is the industry's challenge to all materials which are expected to be available in the postwar scene.

The expanded editorial contents cover such new materials as Allyl Resins, Laminac, Ion Exchange Resins, Plastics from Agricultural Products, Nylon Molding Powder, Synthetic Resins in the Paper Industry. New techniques of manufacture developed to meet wartime production requirements are dealt with in the chapters on Molding with High Frequency Power, Casting Thermoplastics, Blowing of Thermoplastics, Low Pressure Molding of Laminates and Fabricating Polystyrene.

Another indication of plastics growth and maturity is the innovation of the section on Tests and Specifications which includes Procedures on the Identification of Plastics, a list of Standard Testing Methods and the approved ASTM Specifications for Plastic Materials.

The complete Directory and Index Section gives plant and personnel information of plastics manufacturers; complete glossary of commonly used terms; up-to-date bibliography, including foreign language publications; a list of educational institutions sponsoring plastics courses.

There are 12 sections in the book with the headings: Plastics in War; Tests and Specifications; Materials; Engineering and Molding; Fabricating, Finishing and Assembly; Machinery and Equipment; Laminates, Plywood and Vulcanized Fibre; Coatings; Synthetic Fibres; Synthetic Rubber and Rubber-like Plastics; Index; Directory.

Price, $6.00 per copy from 1944 Plastics Catalog, 122 E. 42nd St., New York 17, N. Y.

Tires Can Take It*

Nylon, the flier's safe conduct to the ground in case of emergency, has also proved itself in still another type of landing gear—the big balloon tires of some US Army bombers. Shortly before our entrance into the war, a shipment of 48 tires arrived at Wright Field, the Army Air Forces' big testing base in Ohio. Beneath their rubber treads lay strong, nylon cord, developed and produced by the DuPont Co. The tires were immediately installed, for test purposes, on some bombing planes.

In the war duty that has followed, the performance of the nylon cord tires has been eminently satisfactory. The report is another indication of the versatility of this man-made fiber which has also been in service not only in parachutes but in glider tow ropes and a variety of other vital military uses.

**Du Pont Magazine, Vol. 37, No. 3*

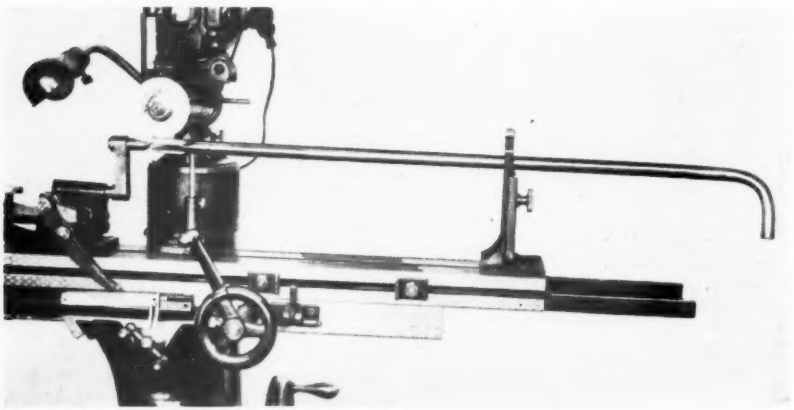
CIRCULAR RELIEF
FOR BENT SHANK TAPS

FOR several years methods and machines have been available for grinding an eccentric or cam-actuated relief on hand or "short lead" taps. These approximate circular reliefs greatly lengthened the tool life but were limited in application to short-lead taps. The results varied with the actual shape of the grind, and this, in turn, was controlled by the shape of the cam or eccentric motion of the grinding head. Consequently, such machines and setups could not be used for sharpening "long lead" or any of the bent shank taps and such taps had to be sharpened by hand.

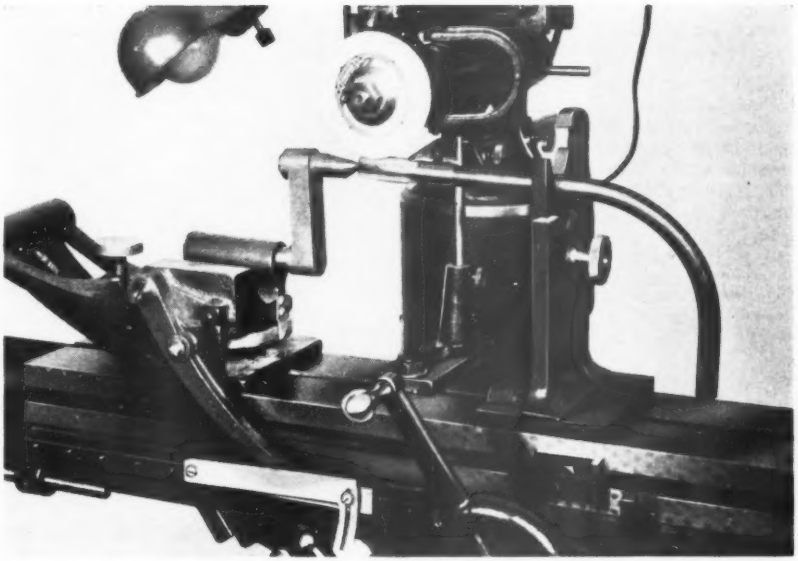
New bent shank taps are given eccentric or circular relief by the manufacturer while the shanks are still straight. Once the shank is bent, the only method of sharpening the tap heretofore has been to grind it "free hand." As with twist drill pointing, it is literally impossible by the "free hand" method, for even the most skilled mechanic to impart a true and mutually symmetrical shape to the several cutting edges. As a result it is not unusual that the total output of the several hand regrinds of a tap will not equal the output of its one original or "factory" grind.

With the combination of equipment and method under discussion, it is possible to get as many as ten grinds, each of which has pre-determined and accurate circular relief insured and is claimed equal to or better than the "factory" grind. This is accomplished on the Circular Relief Grinder which, when equipped with special attachments, will accommodate any size of ship or boiler reamer or tap, including all bent shank taps.

In attaining the highly efficient circular relief in tap grinding the same pro-



This is another of the wide variety of bent shank taps which even an inexperienced operator can grind quickly and accurately on the Circular Relief Grinder.



All sizes and styles of bent shank taps are easily accommodated in the Circular Relief Grinder. The circular relief is dressed into the edge of the wheel by the dresser located immediately above the wheel. Uniform chamfer of each cutting edge is assured and controlled by the adjustable, graduated cam and its follower mechanism.

cedure is followed at the outset as when imparting circular relief to any tool by means of the Cleveland Tool Engineering Company's Circular Relief Grinder. The desired radius is ingeniously gaged and dressed concavely into the edge of the wheel by means of the built-in dresser. The necessary eccentricity of relief is accomplished by a simple positioning of the grinder saddle to slightly displace the tool axis in relation to the center of the radius dressed in the wheel. Therefore, when a straight fluted reamer, for instance, conventionally mounted between centers is traversed under the wheel, its teeth (one at a time) receive a peripherally circular grind of sufficient eccentricity to provide the necessary relief or clearance.

Obviously, bent shank taps cannot be mounted between centers so the Constant Height "V" Block was evolved to be used in place of the conventional tail center. It is an adjustable "V" block support for the tap shank and it insures that shank centers, regardless of shank diameters, will always be at a common height, i. e., in line with the "zero" height of the head center.

The making of this adjustment is of the utmost simplicity and it represents a very clever application of geometry to a mechanical function. It will be noticed that projecting over the rear-most leg of the "V" there is a goose-neck shaped member. This finger is accurately positioned and remains stationary. It has a flat under-surface against which the flat top surface of the rear-most leg of the "V" comes in contact when the "V" block is fully raised. These two flat surfaces are the gaging surfaces by which the "V" block is adjusted so that any and all diameter shanks will be supported at one and the same center height. All that is necessary is to hold the tap shank against the flat surface under the "goose-neck" and raise the "V" block until its flat surface registers against the under side of the shank. In other words, the two flat surfaces can be likened to an adjustable snap gage set to the shank diameter. This adjustment automatically brings the "V"

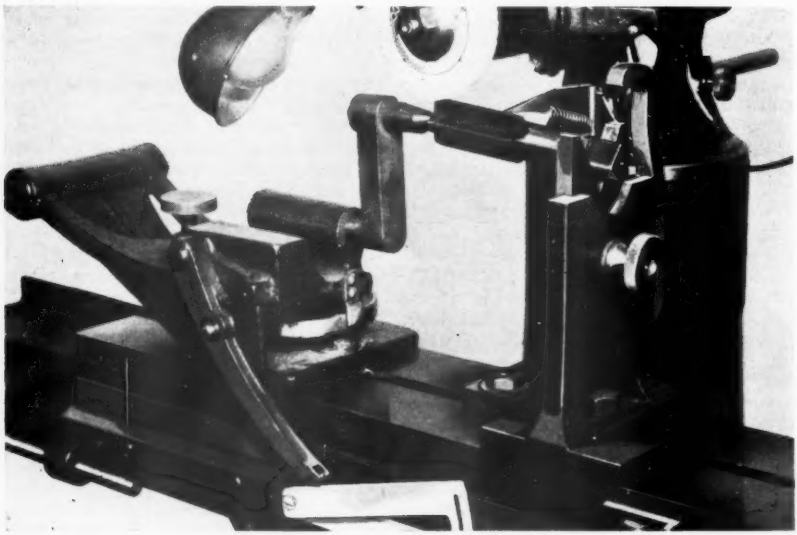
to such a position that when the shank is supported in the "V", the shank center is at the same height as the head center.

The attainment of eccentric circular relief on taps is accomplished by the unique functions of the Circular Relief Grinder in the same manner as for any reamer, end mill, stepped tool or milling cutter. The desired radius of relief is dressed into the wheel, and the necessary eccentricity results from positioning the table saddle so that the tool axis and head and tail centers are slightly offset from the true center of radius as dressed into the wheel.

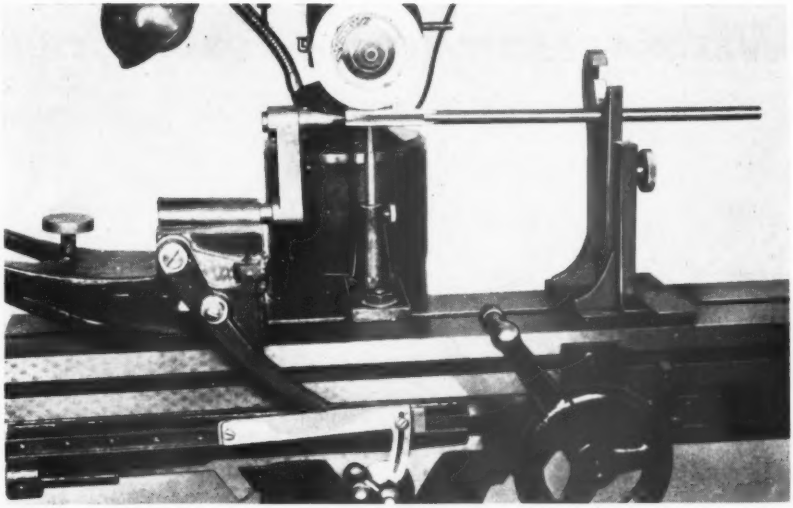
On the saddle, immediately below the front edge of the table can be seen a straight-edged, adjustable and graduated cam. As the table is reciprocated, the head center is caused to rise from and return to its zero setting or normal height by the lever linkage mechanism which terminates in a follower which rides on the cam. This feature is employed when sharpening tapered or stepped tools.

For tools of a constant taper, the cam illustrated is set at such an angle as to give a constant rise (or fall) to the head center as the table is reciprocated and thus the original, correct constant taper of the cutting edge is maintained. As the tapered portion of a tool is usually much shorter than the total length of the tool between centers, the actual movement or distance through which the head center is offset by the cam action is appreciably less than the actual distance that conventional fixed centers would have to be relatively offset to attain the same result. Furthermore, where short steep tapers are involved the tools could not be accurately and safely mounted between fixed centers. This applies to taps and reamers whose teeth are to be given a fairly steep lead or chamfer.

For grinding circular relief into tools of irregular longitudinal cross-sectional profile such as stepped tools or "Xmas tree" tools the cam shown is replaced by one whose profile is of the shape to be



Close-up view of short lead hand tap resting in Constant Height "V" Block. Cam is set for greater angle of chamfer. The round portion of the shank is actually within the "V" altho this is difficult to see due to the angle of view. Note that the "under-flat" of the goose-neck member and the "upper-flat" of the adjustable "V" are separated by an amount equivalent to the shank diameter of the tap.



The same attachments used for sharpening bent shank taps can also be used for sharpening long lead taps regardless of length.

imparted to the tool. Such master cams may be readily calculated and profiled for any particular type of tool. Once made, the cams are saved for use whenever the particular tools come up for resharpening. For such special tool shapes it is readily seen that the cam profile may result in a combination of flats, angles and/or curves.

From this description of the functional operation of the Circular Relief Grinder the simplicity, accuracy, and "fool-proofness" of bent shank tap sharpening should be readily appreciated. The operator rests the tap shank in the "V" and holds the centered end in engagement with the head center, at the same time keeping the teeth indexed against the tooth rest. Then, as the table is reciprocated the cam, causes the head center to rise and fall thus giving the pre-determined angle of chamfer to the grind. A few short passes under the wheel give each row of teeth true circular relief and the proper chamfer.

Oftentimes it is advantageous to give a varying chamfer to a tap. The leading teeth may even be ground down so far as to perform a sizing operation, and this diameter blends thru the conventional chamfer angle to the full thread profile of the teeth. Such a job may be accurately and symmetrically done on a repetitive basis by simply "whittling out" the appropriate cam profile.

Want To Win A War Bond?

For the best and most comprehensive answer to the inquiry "How Would You Lick This Cutting-Off Problem?" a $25 War Bond will be awarded. Second prize is $10; Third, Fourth and Fifth prizes: each, Tool & Die Journal for one year.

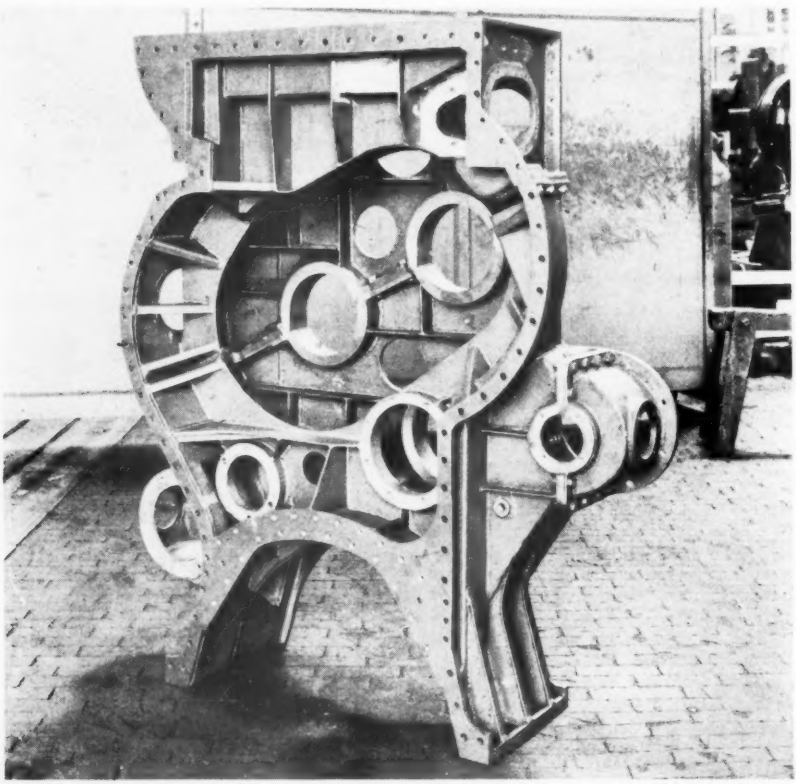
Turn to Page 102 for complete details on the problem and contest rules.

Additional information, machine specifications and illustrated literature on circular relief grinding may be obtained by writing the Cleveland Tool Engineering Company, 1261 W. Fourth St., Cleveland 13, Ohio.

WELDED FABRICATION and PRODUCTION

AMONG the new or greatly expanded techniques brought on by the war is the art of electric arc welding. It would probably be in line to say that there is today in this country 10,000 times as much steel being fabricated by the electric arc process as was the case three years ago. All one has to do is to think of Liberty and Victory freighters, of the shift to the welded Sherman tank, the adoption of the arc welding process in fuselage manufacture. Those are just three spectacular fields in which arc welding has made great and much publicized strides. Recently an American tanker of all welded construction resisted a brace of torpedos that undoubtedly would have sunk her had she

Diesel engine gear casing and end housing. Height: 60½"; Width: 46"; Depth: 12½"; Weight, in the rough: 1875 lbs.



been of all-riveted construction. Although the deck plates of this ship buckled from the force of the explosion, they nevertheless took much of the "kick" out of the blast and the bulkheads were able to hold. The ship made port.

Years ago when arc welding was largely regarded as a makeshift for some minor repair, when it was almost exclusively the spark-shooting tool of the repair shop, industry took it lightly. The factory had an outfit, of course, largely for use of the millwright or maintenance crew. Just a handy way to fix something—and there the matter rested.

Today arc welding is a tool of production. Completely equipped welding departments with staffs of expert welding engineers and equally expert fabricators "do their stuff". Thus is production speeded, the product made lighter, stronger, more sightly, and costs reduced. Professional welding companies —welded steel fabricators—have come into being. They operate by forming and welding parts and sub-assemblies for an ever widening range of manufacturers. They work from blue prints and usually maintain engineering staffs to assist customers in making design changes so that as much of the product as possible can be of welded construction. The United Welding Company of Middletown, Ohio, is such an organization. A division of General Machinery Corporation, it is one of the largest and best equipped fabricating plants in the Middle West. At United are many positioners, both of the pedestal type and skid type, upon which to mount the work. They are all electrically operated and push button controlled. The use of positioners permits the work to be placed so that all welding is "down hand", resulting in faster and better work. Other major equipment items include pantograph burning machine, a ½" by 12' press, annealing furnaces of 16' x 8' x 8' capacity and sand blasting equipment; two cranes (a third on order) and a private rail siding complete the United layout. Thus, they are equipped to handle large work, complicated work, practically anything and everything up to many tons weight that can be formed and welded.

The gear casing here shown is also the end housing for a diesel engine. This assembly posed a real fabrication problem. It was fabricated of rolled steel plates, bars and shapes. The side plates were burned from the flat plate. The bearing pieces were formed from bars burned to shape. The various sub-sections involved were assembled in jigs to make all casings interchangeable. These sub-sections, or assemblies, were then gathered together to form the complete casing. The next step was a trip to the annealing oven for heat-treatment to relieve all stresses that might be present. Finally came straightening and sand blasting to complete the job.

So handled, United Welding was able to produce a very complicated part for a very exacting customer, the United States Navy, since the diesel engine of which this unit is a part went either into a submarine or into an escort craft, and had to be right. It was right—light in weight, relatively speaking, and stronger than a comparable part of cast construction. It was freed of stresses and strains that might fail due to gun concussion or other causes. In addition, the cost was measurably less than had patterns been made and the parts cast.

Another diesel part, typical of current production at United Welding, is a diesel engine frame and it is shown tilted on its positioner so all welding operations can be "down welding" for better welds and greater speed. It is the main housing for an 8-cylinder diesel engine for use in a naval craft. This assembly is made up of 102 parts, including forgings, square welded tubing, alloy plates, and SAE 10-20 steel. The weight of the finished assembly is 1800 pounds. Most of the joints are ⅜" fillets and there are 450 feet of welded joints. Jigs and fixtures are used extensively in the process of manufacturing this assembly. The maximum allowable variation on this assembly is plus or minus $\frac{1}{16}$". To cast such a part, instead of arc welding it, would add greatly to the cost. The reduced weight, greater strength, reduced hazard of interior casting flaws, are all important points when the importance of the engine of which it became a part is considered.

Another interesting problem recently worked out at this progressive plant was a way to form a 122" rewinder drum for

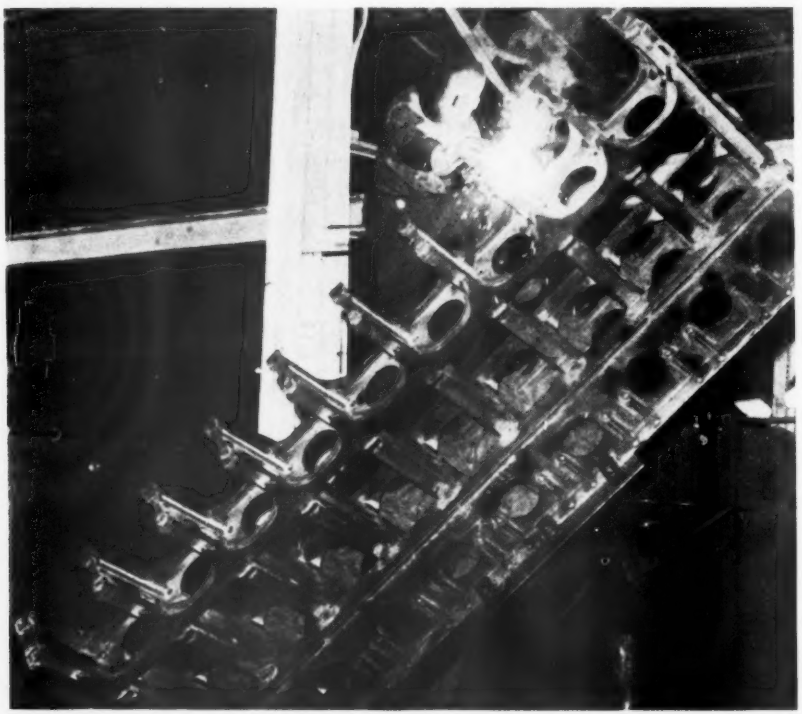
a paper mill. Two ⅜" plates were used, two 180° segments formed and welded. The big problem was to fabricate the part so that it would be straight and also check for balance since it is a revolving part in which any eccentricity would be fatal.

An example of distortion control during welding is represented by a beater roll for use in a paper mill. The roll weighs approximately five tons, is 61" in diameter, and has 62 bars, which are 54" long, 5" wide and ⅝" thick, welded longitudinally around its circumference. The spider, which supports the structure, is made up of ¾" stock and the hub is 1½" in diameter. The assembly is held together by more than 500 feet of ⅜" fillet welds. Distortion from heating is held to a minimum by having two operators work opposite each other at all times in the process of fabrication.

United Welding Company forms and welds many machine tool bases and frames and hydraulic press frames, both vertical and horizontal. Production schedules on long runs are growing in favor. In such cases welding is far less costly, is faster, can deliver rounded corners without machining to improve appearance of the finished product. Coolant troughs, fluid tanks and other features can be more readily built integral with the machine. Other items of production importance at United include field rings for motors, generators, gears, etc. of magnetic iron, steel, alloy steel as specified.

At present their entire facilities are being utilized for war work in the performance of which United Welding workers have won the Army-Navy "E".

A diesel engine frame member. In this assembly are 102 parts and 450 feet of welded joints.



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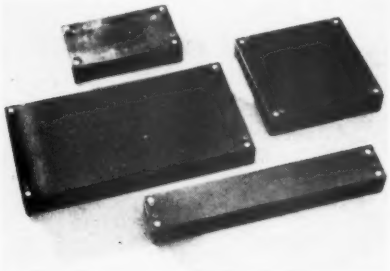
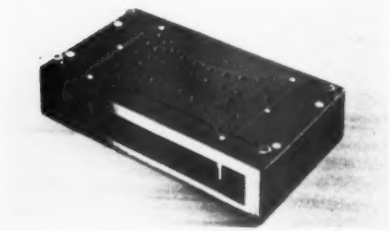
WALES PLATE SET SYSTEM

A T. & D. J. Picture Story

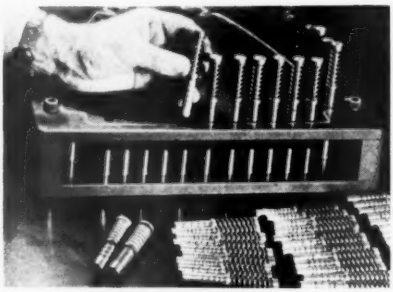
AN interesting and recent development for punching holes in flat material comes from the Wales-Strippit Corporation, North Tonawanda, New York. It involves the use of Walesite Plate Sets available in 48 standard sizes, with



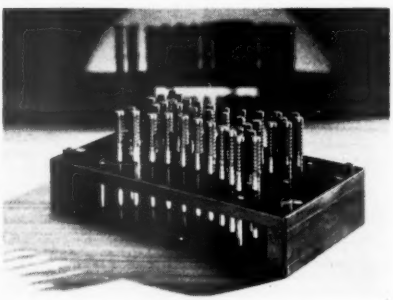
their punch assemblies and dies. The punch assemblies and dies may be used and re-used in an unlimited number of plate sets because they are manufactured in standard sizes for quick interchangeability. Holes may be punched in any pattern in sheets up to 43" x 45", the minimum center-to-center hole location being ½" in any direction. Each



Walesite Plate Set consists of two plates which are made of Walesite, a plastic material uniquely applicable to this new method of hole punching. These are separated by Walesite spacer bars and are held together rigidly by bolts and dowel pins.



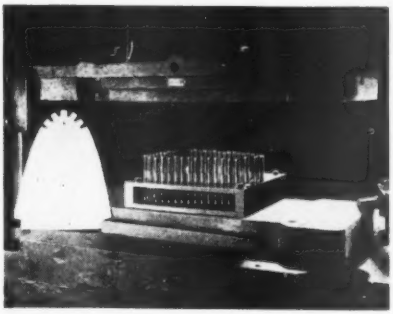
From a master locating template holes are drilled in the top and bottom plates for punch assemblies and dies. The holes in both plates are drilled in the same operation to assure perfect alignment of punch and die. The entire punch assembly, consisting of punch, stripping



spring, guide and lifter spring, is inserted in the top plate and the die is a press fit in the bottom plate.

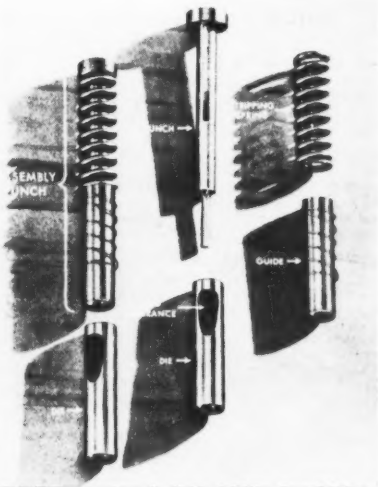
The outstanding advantage of this system is the quick, easy manner in

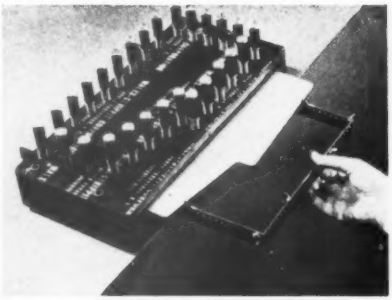
which an entire plate set assembly can be made outside the press. The assembly is ready to operate at the first down stroke of the press ram because the punches and dies are automatically aligned. In addition, it is completely self-contained with nothing attached to



press ram, hence no adjusting and no locating is required.

While one plate assembly is operating in the press, another plate assembly may be made up away from the press and this second assembly may immediately replace the first on completion of the run. A third assembly may be made by using a third plate set and re-using

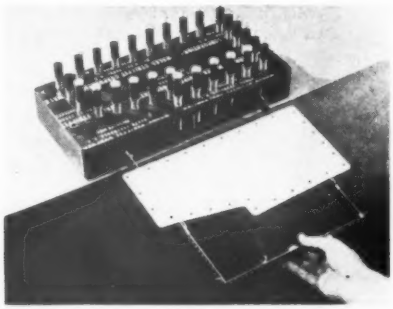




punch assemblies and dies from the first assembly, thus the punches and dies may be kept in continuous operation.

With an initial stock of Wales punch assemblies and dies all that is required is a Wales Plate Set for each master template and/or job. The design of punch assemblies and dies makes it possible to replace punches and dies without disturbing the set-ups. To store patterns requires only the storage of plate sets with pattern holes.

The Wales adjustable feed carriages



carry, nest and remove blanks in and out of the plate set assemblies with speed and with a greater safety factor to the operation. Feeding and removing blanks by means of this carriage involves only a simple hand motion. The carriages are adjustable for width (left to right), thus permitting their use in any plate assembly and clip-type lugs are adjustable in front and back to fit various sizes and shapes of blanks.

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DRAWING FINE UNCOATED STEEL WIRE*

by R. R. Preston**

FINE drawn wire without a coating of copper, tin, or zinc is playing a very important part in winning the war since such large quantities of it are now being used for rope wire and aircraft control cables, and to a lesser degree in balloon barrage work. Therefore, it is of the utmost importance to know the proper technique for producing a high grade product on a quantity basis. The three most important things in drawing uncoated fine steel wire are: preparatory cleaning, proper lubrication, and the drawing dies.

For the purpose of this article, it will be assumed that the wire being dealt with is .036" wire which has been properly patented in a conventional type of patenting furnace. In this connection, the wire must be free from all scratches before receiving final patenting and have uniform carbon content for best results. Since every wire mill has its own patenting methods, ranges of time, etc., that work best for its particular conditions, little will be said on *that* point. However, a number of factors controlling the economic drawing of fine uncoated steel wire are affected *by patenting methods and equipment.* These will be pointed out. One is that, if large quantities of wire are to be drawn, it is always good practice to send through pilot lots from each heat inasmuch as different heats of steel of identical analysis often work differently.

After patenting, the wire must be thoroughly cleaned. It is impossible to over-emphasize the importance of the operations grouped under the general heading of "cleaning". Good practice is to clean the wire first with muriatic acid and then with sulphuric acid. If conditions are right, however, good cleaning can be effected by using either muriatic or sulphuric alone. A plant having a small cleaning house equipped with a few tubs will usually get best all-round results by using sulphuric acid alone. Muriatic is actually the better cleaning agent, but is also the more expensive of the two acids. On the other hand, sulphuric gives a slight etch to the wire's surface which lets the lime adhere better to the steel. The wire must be well spread out on the yokes before immersing in the acid baths because the cleaning process *must* remove all traces of scale from the metal. If the scale proves too tight, the wire must either be left longer in the acid or else the atmosphere of the patenting furnace will have to be readjusted to give a heavier, looser scale which will come off more readily. Readjusting the furnace is more satisfactory than letting the wire soak in acid. For instance, it sometimes has been found that a consequence of the time-saving obtainable through the use of modern electric patenting furnaces is the formation of a very tight, thin scale which is extremely difficult to remove from the wire. This, as has been mentioned, can be controlled by varying the atmosphere. In any event, one result to strive for in patenting is to get the kind of scale which can be most easily removed *by the existing cleaning setup.*

Muriatic acid should be used cold. Sulphuric, however, works best between 120° F and 130° F. The acid must not be allowed to get too hot, nor the wire permitted to remain too long in the bath. Either condition may result in pitting the surface of the wire, or may even start acid embrittlement in the steel. It has been found to be good practice to remove the wire bundles from the acid when about half cleaned, rinse them with water to remove the scale already loosened, turn the bundles, then return them to the acid bath. The cleaned wire must be well rinsed while still on the yoke. A good device for rinsing is a tub partially filled with running water supplied by high pressure sprays from the sides. The wire is dipped up and down in the tub through the spray. This arrangement is particularly effective for removing loosened scale.

*Abstract of a paper presented before the Fall 1943 Pacific Coast Meeting of The Wire Association at San Francisco. **Engineer, Carboloy Company, Inc., Pittsburgh, Pa.

Careful visual inspection of all scale after rinsing is absolutely essential to insure a high grade finished product. The wire should be examined to see if any bits of scale still cling to it. In cases of doubt, such as where the scale is thin and therefore difficult to detect, the wire can be bent a little to pop off any remaining scale. Rinsed wire must also be examined for smudge caused by the action of acid on steel. The wire, as it comes from the rinse, should be bright and free from all smudge. Sometimes, even in the best of plants, this condition is not always obtained. If acid smudge is permitted to remain on the wire, it is liable to form an abrasive material which later on may scratch both wire and dies. Then, too, smudge comes off easily and, after liming, will carry the lime away with it. For these reasons, every bit of wire coming from the rinse must be thoroughly inspected.

Wire that has been cleaned and rinsed in the manner just outlined is ready for liming. The characteristics of the lime itself are of major importance since lime must neutralize the acid, act as a lubricant carrier and keep the wire from rusting. Some lime works well and some doesn't. Perhaps the best practice for a wire mill is to work with a reputable lime dealer and have him recommend the grade of lime most satisfactory for drawing fine uncoated steel wire. Air slaked lime is undesirable for any kind of wire drawing which requires more than two drafts. One of the most important things about lime is that it *must be free from grit*. After the lime has been slaked, it is desirable to age or hold it in putty form for from 30 to 60 days before using it. One method of accomplishing this is to have two lime vats, each capable of holding a 60 to 90 days supply. When one vat is emptied, lime from the other can be used immediately. At the same time, more lime can be slaked in the first vat.

For liming, it has been found best to take the lime in putty form, put it into a steel tube, and thin with water to between 8% and 10% by titration. A rather heavy lime has been found to give good results in drawing fine uncoated steel wires.

The lime solution should be kept around 180° F. Four to six dips of the wire in this generally give optimum results, though each mill must determine its exact procedure. The stock should be turned over between each dip so that every strand gets thoroughly covered with lime. Too heavy a coating of lime on the wire will flake off.

The baking process which follows liming dries the lime on the wire and also prevents any tendency towards acid embrittlement. Apparently the most successful baking method yet introduced is the *tunnel type of baking*, with temperatures held between 300° F and 350° F. Sometimes the wire is put through the oven on a truck; at other times on a sloping track. Baking time depends to a large extent on type of oven. In older types, it required about 8 hours to produce adequate results. In some of the newer circulating bakers, from 1 to 2 hours is enough. The optimum baking time has to be determined independently by each plant on the basis of experience due to varying mill conditions. It must be remembered, however, that unless the wire is baked sufficiently, the lime will come off during drawing.

All wire must be inspected *after* leaving the baker and *before* delivery to the draw benches to ascertain if the wire is still entirely free from rust. If rust is present after liming, it will come through the lime coating during baking and show up then. If baked wire exhibits this condition, the wire must be returned to stock and cleaned again.

After baking, the wire should be stored no longer than from 8 to 16 hours prior to drawing. If left longer than that, the lime coating will soften and rust will form on the steel, causing difficulties in drawing later on.

After the wire has been butt welded, the flash is removed with a file. All remaining burrs should be removed with emery cloth and the bare wire at the weld lubricated with hard soap. Ordinary laundry soap is excellent. The diameter of the wire at the weld must be slightly under normal wire size to prevent fracture when drawing. Either too much or too little welding heat may cause breaks during drawing. A little intelligent experimenting with the welder should enable the operator to turn out welds which will seldom, if ever, fail.

Operators should always use magnifying glasses to check the condition of the wire at the welds. Constant use of the glass will prevent a lot of trouble.

The first draft, when the wire passes through the box on the outside of the machine, should be a skin draw and drawn dry. Very fine soap or soap flour can be used. The soap should be periodically freshened to prevent excessive contamination by the lime which is left as the wire passes through it. The first draw should reduce the wire just enough to form a coating on the uncoated wire of not more than .002". A heavier draft will scrape off so much of the lime that there won't be enough left to carry the lubricant through the remaining wet dies in the machine. After the first draft, a reduction of about 25% has been found to be satisfactory.

It is good practice for the die on the first draft to have a 30° entering angle blended into a light 12° approach angle. The bearing length should be around a minimum of 75% of the wire diameter. The stock should enter the remainder of the dies on a 12° angle with a 75% bearing length.

A good finish and polish must be maintained in dies for drawing fine uncoated wire. It is also well to remember that a smoothly polished carbide die, aside from improving quality, will also last far longer in service between polishings. The first sign of wear in a carbide die used for any kind of wire drawing is the formation of a light ring at the approach angle. If this ring is permitted to become too deep it will scratch the wire and then the die will have to be rough drilled to completely remove the ring. All mills using carbide dies for drawing fine uncoated wire should establish a rigid routine for servicing these dies on the basis of removing them *before* signs of wear appear. Finishing dies usually should be removed and replaced more often than dies used in the earlier draws, about every 8 hours for the one, and every 16 hours for the others.

Lubricant is an important consideration in drawing fine uncoated steel wire. Best success is usually obtained by keeping the fat content between 3% and 4% by volume and as near 3% as possible. Temperature should be maintained between 110° F and 120° F. Lubricant should be tested for fat content at least once in every 24 hours. Each installation has its optimum speed for drawing fine uncoated steel wires of different carbon contents. Older equipment will give a drawing speed as low as 150 feet per minute. Modern continuous machines range from 800 to 2200 feet per minute. The average optimum rate for drawing wire of this type, however, is between 800 and 1000 feet per minute on most machines. When drawing low carbon wires, the average is between 1000 and 1500 feet per minute.

In summing up, it must be remembered that the successful drawing of fine uncoated steel wire is not alone a matter of good dies and good die maintenance—or of proper patenting—or proper liming with the correct grade of lime—or correct baking—or complete cleaning; it is the recognition and successful control of all of these factors.

★

...editorial

SURVEY OF BUYING INTENT

(CONTINUED FROM PAGE 77)

Radio manufacturers apparently have a selling job cut out for them, although it is likely that the Chamber of Commerce poll included principally home radios, whereas the total sales figures for '40 and '41 include all types of radios of which those for automobiles would comprise a considerable portion.

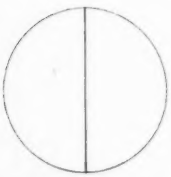
Surveys like this should serve a good purpose. They should not adversely affect the production of needed war products. Rather they should be thought of as similar to barometric and atmospheric conditions and the direction and velocity of the winds, which are studied, charted, and interpreted to provide us with weather forecasts. As such a forecast provides the aviator and the mariner with data to chart his course safely, so these surveys, carefully studied by Industry, should enable manufacturers of consumer goods to predetermine their markets and enable them to call in for necessary cooperation their parts and tool manufacturers and their producers of materials.

OPTICAL INSTRUMENT LINE MARKS

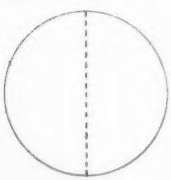
E. Willard Pennington
TECHNICAL EDITOR

MANY of us have experienced the uncertainty, when using a toolmaker's microscope, as to whether we had the edge of the object being measured and the eye-piece hairline in exact coincidence. Particularly at high magnifications it is difficult to get repeat readings to within one or two "tenths" of the cross-stage travel. This difficulty prevails whether we are working with reflected light or transmitted light.

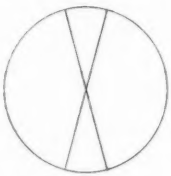
In the first instance, that of reflected light whereby the object is illuminated from above, we are distracted by the varying quality of illumination prevailing at the edge of the object or tool. Regardless of how "sharp" the edge may be, a radius or rounding exists which varies so in light reflective value that the hairline becomes almost lost.



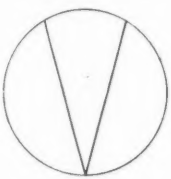
In the second instance, that of transmitted light whereby the object is illuminated from below, the sensitivity of our control is affected by the diffraction of light rays interrupted by the edge of the object and also by the partial "blacking-out" of the whole field of view and particularly by the total "blacking-out" of the hairline as we manipulate the stage to get a zero setting or coincidence between the opaque edge of the object and the opaque hairline.



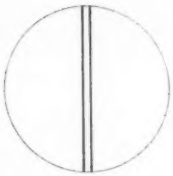
In both cases, when we try to overcome these difficulties by the practice of using first one side of the hairline and then the other, we are up against another handicap. Assume that we are measuring the length of an object by traversing the microscope stage so that first one edge or end of the object is in optical contact with one side of the hairline and then the other end of the object is brought into optical contact with the *other* side of the hairline, our length measurement as read from the micrometer screw has to be corrected by a factor representing the object field equivalence of the hairline thickness or breadth. When we are working in "tenths" and fractions of "tenths" this value has to be subtracted from the gross reading originally noted.



One method of overcoming this difficulty is to break the hairline into a pattern of short lines and spaces, which is very helpful in working with reflected light when the interrupted hairline can be superimposed on the illuminated surface texture of the object. When working with transmitted light the object becomes a black, opaque profile in the field of view, and if we try to "split" the broken hairline with the edge of the object that portion of the hairline that overlaps the object becomes "blacked out." It becomes, therefore, most difficult to determine the exact half width of the hairline. The symmetry of ocular hairlines of "X" and "V" patterns permits quite accurate work by reflected light but presents the same "blacked out" fault when working with opaque profiles and transmitted light. Additionally we lose the advantage of a straight line that can be successively

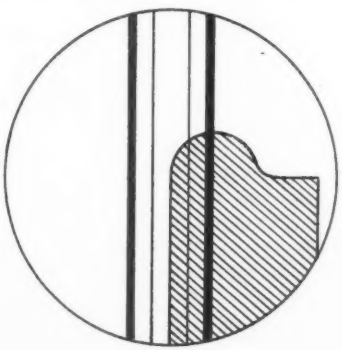


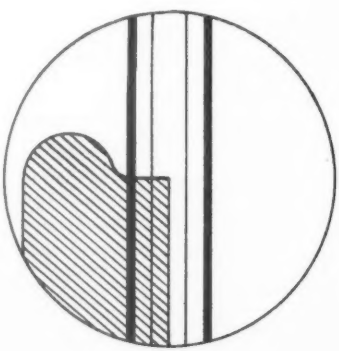
indexed against parallel edges of the object being measured.



Double hairlines are practical in optical measuring instrument applications where a zero setting, or any other reading, is established by a third line, in the object field, which is brought to bi-sect the space between the two ocular lines. The sensitivity of the human eye in judging the symmetry of two similar, adjacent and simple shapes permits very accurate manipulation. In this case it is fairly easy to manipulate the instrument so that the third hairline occupies a position half way between the others to a high degree of accuracy and readily repeatable. If the widths and spacings of the lines are such that, when the space between the two lines is bi-sected by the third line, the resultant pattern is one of equally wide lines and spaces we have a most sensitive condition that facilitates repeat settings with a negligible degree of error. However, under conditions combining transmitted light and opaque objects the double line loses value because as the space between becomes "blacked out" by the edge of an object it becomes impossible to estimate the true mid-point.

In making a study of enemy patents vested by our Government, one was found (U. S. Patent #1,836,167) in the optics classification that covers a most ingenious symmetrical line pattern that overcomes all of the above mentioned disadvantages. It consists of four lines and three spaces as shown in the accompanying drawing. The two outermost lines are very broad, giving the effect of opaque surfaces. Of the three spaces, the two outermost spaces are of equal width, and each is equal to one-half the width of the center space. In the drawing, a small form tool is represented in the field of view. In measuring its width, first one edge and then the other is brought to the center of the optical field. In each case, establishing symmetry of the *unobscured* portion of the pattern meant that each edge of the tool had been, in turn, located in the center of the field, truly bi-secting the *center* space. Accurately bi-secting the center space reduces its width to equal either one of the other two spaces, depending on which edge of the tool is being located. The fact that the outermost lines are relatively broad results, in each case, in a contrast effect that allows the symmetry of either pair of illuminated spaces adjacent to the respective edges of the tool to be most sensitively and accurately established. This line pattern can be employed either in a measuring microscope ocular field or on the ground glass screen of an optical profile projector. Complete information on vested enemy patents, classifications, licensing procedure, etc., may be obtained from the Office of Alien Property Custodian, Chicago, Ill.





INDUSTRIAL DIGEST

TOOLING • PRODUCTION • METHODS
TRADE NEWS AND REPORTS

Precision Balancing

UNBALANCE of armatures can be located in ⅛ to 1/10 the time required for mechanical balancing with the illustrated dynetric balancing unit used by Westinghouse at East Pittsburgh. It is possible to precision balance armatures for 50 hp to 200 hp motors to 1/10,000 of an inch of linear movement.

The operator proceeds as follows to balance an armature: (1) Places the shaft of the armature in floating bearings. (2) Connects the armature shaft to that of a motor driven sine wave generator. (3) Adds a known weight of molding clay to one end of the armature of the "O" reference point of the sine wave generator index wheel. (4) Rotates armatures at 600 rpm. (5) Manually adjusts sine wave generator until the rotor is in phase with the stator, at which point the armature is in balance with the machine. (6) Weight of metal necessary to bring one end of the armature in balance is read on the scale of the large instrument in center of panel. The horizontal movement of the armature, due to vibration, is transmitted by the floating bearings through a mechanical connection to an electrical coil whence it is electrically transmitted to electronic tubes which amplify the unbalance so it can be recorded by the instrument. (7) Sine wave stator index wheel indicates place on armature with respect to "O" reference point of the sine wave generator index wheel where the weight that was read on the instrument must be added to bring that end of the armature in balance. The operator then repeats these steps for balancing the opposite end of the armature.

Postwar Business Will Convert Yesterday's Luxuries into Tomorrow's Necessities

At the beginning of the last postwar period (World War I) some 500 industrial research laboratories employed a total of 6600 workers. At the start of the present war, or by 1939, industrial research laboratories had increased in number to 1800, acounting for a total of 32,000 employees. In the same period, 1920 to 1939, annual expenditures by research laboratories increased four-fold from 25 million to 100 million dollars.

During wartime, industrial research becomes war products research and is participated in by private capital and personnel and by governmental appropriation and staffs.

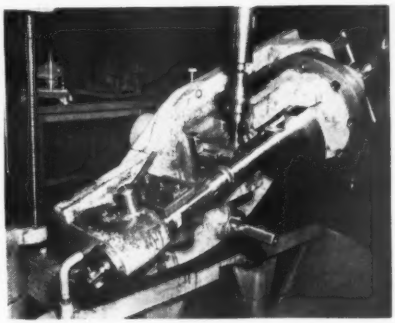
Because an increasing amount of research has successfully solved one war problem after another it is logical that the cost, number of laboratories and researchers employed therein will become greater as the war progresses. It will be some time before accurate figures are available to assay the effect of the present war program on industrial research.

Because of the research that has been done since this war started, combined with pre-war research, it is going to be both challenging and difficult to satisfy all desires and to buy all that will seem necessary for any business, profession or hobby.

This combined challenge and difficulty should be the greatest "green light" of all to postwar business. No other people can approach this country's complimentary skills of creating desires and fulfilling wants!

Drill Jig for Small Holes

A SPECIAL box-type drill jig developed by the Lycoming Division of The Aviation Corporation makes possible the drilling and reaming of all small holes in crankshafts for its R-680 radial aircooled engines in one operation. Five separate jigs formerly were required for this operation.



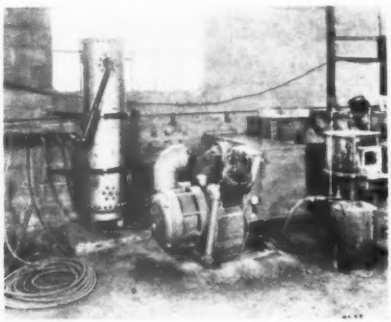
The new device reduces set-up time by eighty per cent and loss of critical material, from nicks and scratches to crankshaft surfaces caused by handling, has decreased at least proportionately.

The jig is mounted on trunnions and set up on a drill press table. Once located in it, the crankshaft can be rotated or tilted to any angle or position for drilling all oil holes, oil tube holes and propeller nut dowel pin holes. Movement of the jig is controlled by index plates on the back and front of the fixture.

Quality control is likewise improved by the new jig. All holes for dowel pins and oil tubes must be held to within .0005 tolerance in diameter. With this jig, one operator is responsible for the entire drilling sequence.

Compressed Air For The Small Shop

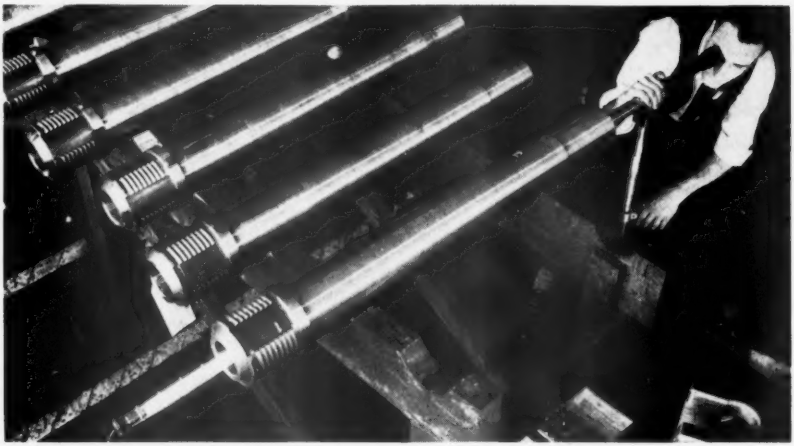
EFFICIENT use of compressed air is not confined to any particular size plant. From the manufacturer requiring thousands of horse power to create air pressure in large quantities for operating many different kinds of production tools, down to the small shop where only a limited number of air tools are used, the same convenience and operating efficiencies hold true.



Illustrated is a typical installation of the small compressed air plant. This one, compressing air power for grinders, chippers, buffers, paint spray and cutting wheels, is designed to compress just enough, but not more than is actually needed.

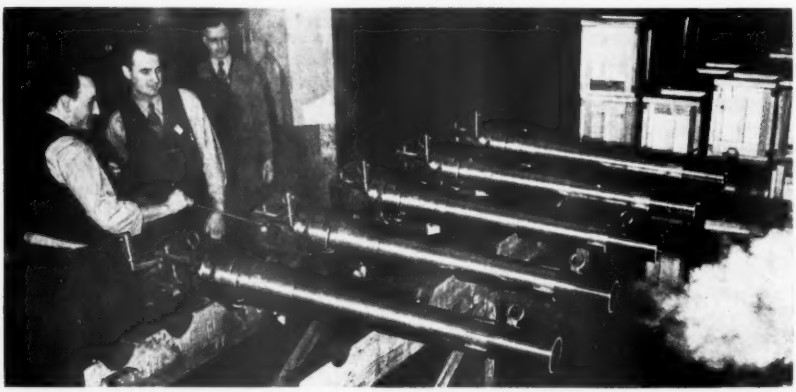
In the photograph will be noted the ingenious arrangement of these valves in a section of the receiver outlet pipe. Air leaks are thus confined to a very few feet of air line when air is not being used. Needed air pressure is kept up by automatic start and stop of the electric motor built into the compressor unit.

The flexibility of small installations affords high efficiency for the small shop and avoids the necessity of individual power units for each production tool. Such installations as this are growing in number, according to the Compressed Air Institute.



Borescope Inspection of 75mm Pack Howitzers

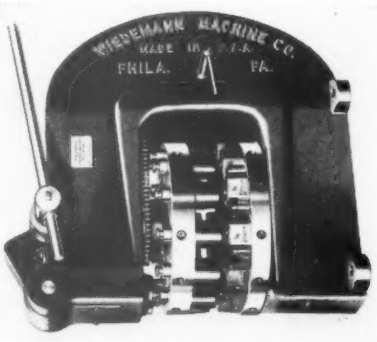
Originally designed for mule transport, Ordnance's 75 mm pack howitzer when dropped by parachute can be assembled and ready to fire in eight minutes. The gun barrels and breech mechanisms are made at General Electric's Erie Works. Inspection of the howitzer tube is made with a borescope. The borescope may be used for closely examining the interior surfaces of pipes, tubes and blind bores. With it the presence of pits, cracks, corrosion markings or other visual flaws in machined surfaces and rifling can readily be detected. The surface quality of internal threads can be examined for roughness, burrs and tool marks. Its optical system gives a view of a circular portion of the bore directly opposite the objective lens. A photographic record may be obtained by positioning a camera at the eyepiece. This optical instrument extends into the bore and carries a mirror at the far end which reflects an image of the surface into a microscope. The surface is illuminated by an electric lamp and is magnified 20 times. Another test consists of firing three rounds of primers in empty shell cases in each howitzer to check the breech mechanism.



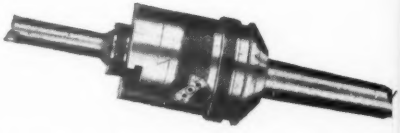
PROGRESS ON PARADE

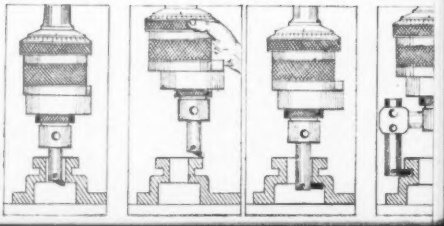
SINE PLATE FOR PRECISION SET-UPS. A large capacity sine plate that facilitates the accurate checking of angular measure in the inspection of tools and production parts is a recent offering of the CARRUTH SALES CO., 704½ Boulevard Bldg., Detroit, Mich. This fixture will handle work ranging in size up to 6" x 10". The desired angle between the base plate and the work supporting surface is attained by the familiar gage block build-up method. For clamping purposes the work surface is provided with 54 tapped holes of ⅜" diameter. 833-G

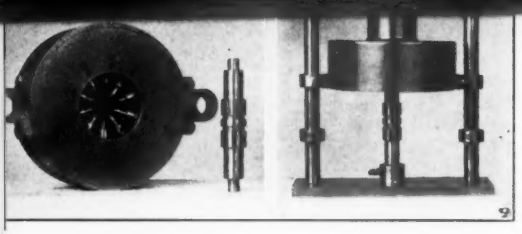
TURRET PUNCH PRESSES. This rugged equipment incorporates 11 or 12 punches and dies in an easily rotating turret—thus eliminating die set-ups for short run punching and piercing operations. In addition, it eliminates such operations as drilling, fly cutting, hand cutting, etc. These presses develop 15,000 pounds pressure by applying 140 pounds on the 30" handle. This tremendous pressure is accomplished by means of a new type of lever mechanism. Punches and dies are ground and are held to extremely close tolerances with a standard clearance of .006". A copy of Bulletin 24 will be sent by WIEDEMANN MACHINE COMPANY, 1815 Sedgley Ave., Philadelphia, Pa. 818-G



BORING AND FACING TOOL HEAD. With the Chandler-Duplex Boring and Facing Tool Head all operations such as turning, boring, facing, undercutting and recessing can be accomplished at one setting. The feature of power uniform feed insures accuracy and quality finish. When the power feed is not in use, as in straight boring, the feed ring revolves with the head, but by arresting the movement of this ring as the head revolves, the dove-tail slide is caused to move radially .005" per revolution thus carrying the tool toward or away from center for facing or undercutting as the case may be. Literature may be obtained from CHANDLER TOOL CO., 514 Ohio Ave., Muncie, Ind. 820-G

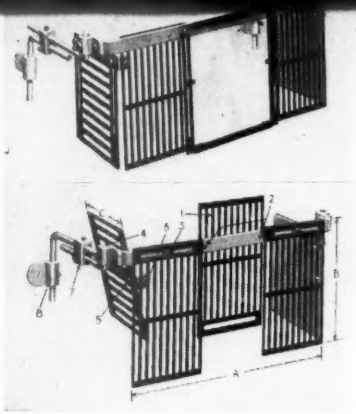






MULTIPLE CUTTER HEAD. The Universal Multiple Cutter-Milling and Splining Head is a newly developed device for the milling of Multiple Splines, grooves, or slots of all types in drive shafts, propeller shafts and other components requiring Multiple Splines or grooves. A symmetrical arrangement of ten radial spindles permits the machining of various types and shapes of splines or grooves simply by changing the cutting tools. The cutting tools may be adjusted to an accurate micrometer setting from the outside while the head is in operation. The head illustrated will handle work ranging in diameter from ¾" to 2" and larger machines having capacities up to 5" are available. For detailed information address EARLE G. BOYER, 6944 Cresheim Rd., Philadelphia 19, Pa. 819-G

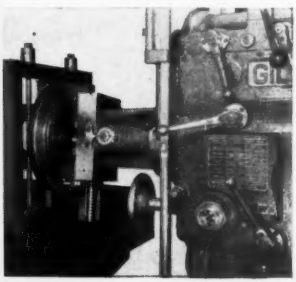
REGENT FACING AND BORING HEAD. For use on horizontal boring bars is a new tool, developed by the PAPER CONVERTING MACHINE CO., Green Bay, Wis., under the trade name "Regent", which functions as a selective automatic feed facing and boring head. It is made in two sizes—Model 20 with a range from 0" to 24" diameter and Model 10 with a range from 0" to 12" diameter. Illustrated here is Model 20 doing a step facing job. The "Regent" boring head utilizes the forward and backward feed mechanism of the boring bar itself to automatically outwardly or inwardly feed the tool holder slide, thereby providing a wide range of cuts for roughing and finishing. 817-G

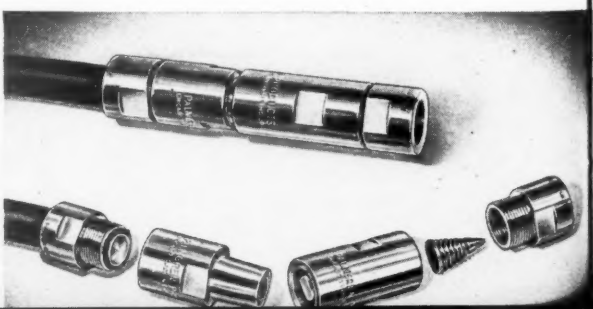


MARTIN PRESS ENCLOSURE GUARDS. These guards keep the operator's hands out of the danger zone yet permit holding or feeding the work close to the die. The guard is applicable to any operation such as blanking, strip-feeding, punching, notching, etc., where the operator does not have to place the individual part directly in the die. It can also be applied to hand-fed operations through the use of a slide feed, dial feed, safety tongs or similar methods of setting the part in the die. W. I. MARTIN & CO., 711½ So. Dearborn St., Chicago, Ill. 382-G

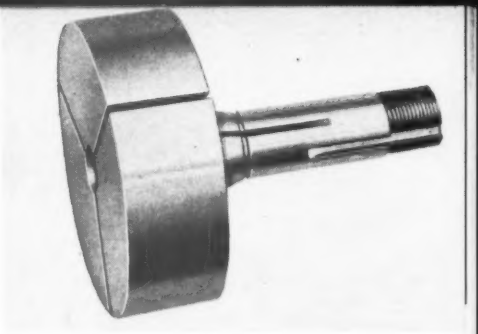
PALMGREN SOLDERLESS CONNECTORS make it possible to assemble various lengths of welding cable or other cables to their respective connectors in the field and on the job in a moment's time. No longer is it necessary to have special tools to make connections.

The illustration shows the taper plug which is forced into center cable after insulation is removed. Screwing nut and body together forces taper plug flush with threaded end of nut, making a tight connection with positive conductivity. CHICAGO TOOL & ENGINEERING CO., 8391 South Chicago Ave., Chicago 17, Ill. 591-G

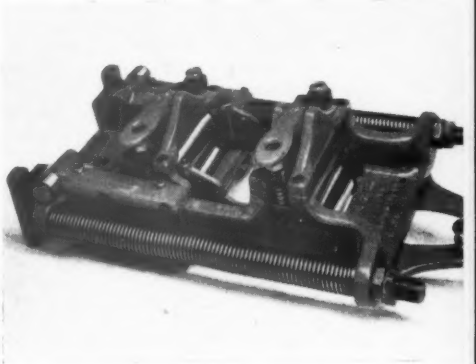




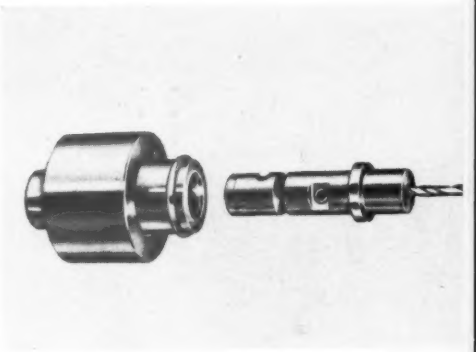
G-B-M COLLET CHUCK. Used for second operation lathe work, this step-collet operates with the usual draw-in collet attachments on a lathe. With the collet chuck held in the lathe, a recess is bored in the head the size of the work to be held and the bored segments form the jaws of the chuck which grip the work when the draw-bar pulls the tapered shoulder against the closing sleeve. Since the work recess is bored on the same set-up as succeeding operations in production, all work is thereafter chucked concentric without indicating each piece. THE GILBERT-BAKER-MIDLAM CO., Dept. J, 38 N. Jefferson St., Dayton 2, Ohio. 841-G



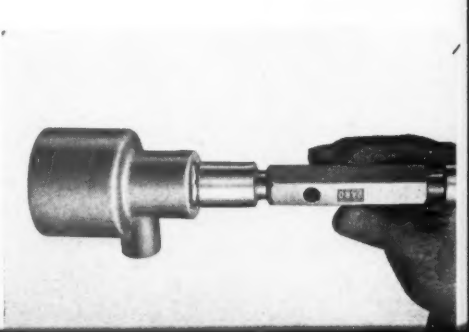
THE NEW DICKERMAN DIE FEED embodies all the advantages of the original plus new features that permit the handling of heavier material in wider widths. The installation of the Dickerman Die Feed on presses reduces the factor of human error to a minimum as the work becomes automatic in operation. It can be installed on almost any type of punch press, and can be placed on the die-set in any position for any style die. H. E. DICKERMAN MFG. CO., Dept. TD, 321 Albany St., Springfield, Mass. 270-G

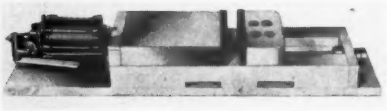


CENTRIF-O-MATIC DRILL CHUCK. permits the operator to change drills or change from drill to countersink and other tools rapidly while the motor is running. Besides effecting an appreciable saving in production time the use of these chucks can lower power tool inventory and maintenance costs. Change of tools is accomplished without cutting off the power simply by sliding back an outer sleeve on the chuck. This releases a centrifugal lock and permits the tool and its adapter to be removed. A new tool is inserted and the sleeve snapped back in position thus locking the tool centrifugally. R. M. WRIGHT CO., Washington Square Bldg., Royal Oak, Mich. 840-G



A PILOTED CYLINDRICAL PLUG GAGE is particularly adapted to gaging holes which must be held to very close tolerances and also to gaging on machines where pieces to be checked cannot be removed. A piloted gage will enter holes where tolerances are close more readily than unpiloted gages of the same size, because the pilot aligns the gage with the axis of the hole to be gaged. It will more than double the number of holes that can be gaged by an unpiloted gage. VARD INC., 2981 E. Colorado Blvd., Pasadena, Calif. 509-G

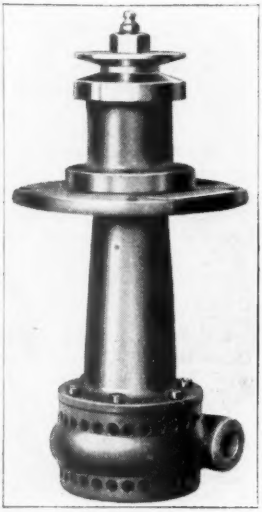




THE BELLOWS AIR VISE is a new automatic milling machine vise which develops clamping pressures adjustable to 40,000 lbs. Powered by the Bellows Air Motor the new vise operates on a line pressure of 80 to 100 lbs. Air consumption is extremely low, averaging less than 1/10th of a cubic foot of free air per cycle. A double acting valve, integral with the vise, has an adjustable control lever permitting operation of the valve from any angle in any plane. THE BELLOWS COMPANY, Akron, Ohio. 839-G

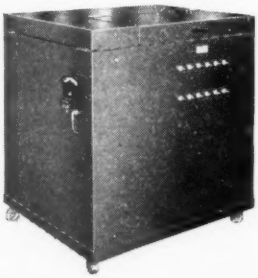
KENNAMETAL, INC., 500 Lloyd Ave., Latrobe, Pa., has developed a new and revolutionary type file made of the same hard, high strength cemented carbide compositions as the well-known steel-cutting Kennametal lathe and boring tools.

It is claimed that extended service trials have demonstrated that the Kennametal file will permit filing speeds of 3 to 10 times that possible with steel files, and outlast them 50 to 200 times. It will cut steels of a hardness up to 62 Rockwell C, which the ordinary file will not touch. 33-G



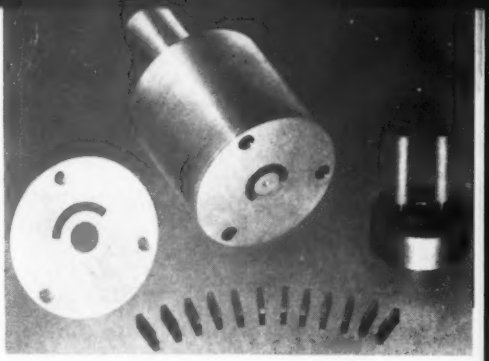
A NEW BELT DRIVEN GUSHER PUMP known as Model 1-P3 operates in a vertical position. The Pump stem, flange and impeller housing used in the construction of this model are interchangeable with and available in two lengths similar to Gusher motor driven Model 1-P3 Pump. RUTHMAN MACHINERY CO., 1808 Reading Rd., Cincinnati 2, Ohio. 318-G

THE DUAL TEST CABINET for Sub-Zero and High temperature testing will reduce the temperature in a 90° F room from 180° F to -70° F in 6 hours. Likewise the heating cycle from -70° F to 180° can be accomplished in an hour's time. Any desired temperature will be automatically held between the two points. REVCO, INC., Deerfield, Mich. 553-G



SPECIAL CIRCULAR TYPE HOLDER—WM. A. FORCE & CO., INC., Brooklyn 8, N. Y., Numbering and Marketing Machine manufacturers, have recently completed a quantity of Circular Type Holders of special design for marking flat, circular pieces on a variety of radii.

The Type Holder pictured is fitted with individual spacer rings and retainers, such as illustrated on either side of the holder, permitting it to be used for marking pieces of different curvature. Changes from one curvature to another are quickly made by removing the retainer plate and pulling out the inside recess rings, one of which is shown fitted with the removal pin, as shown in the lower right-hand section of the illustration. **293-G**



A NEW HIGH-SPEED AUTOMATIC TAPPING MACHINE which will tap a class 3 fit on a production basis has been developed by the CLEVELAND TAPPING MACHINE CO., 1725 Superior Ave., Cleveland, O.

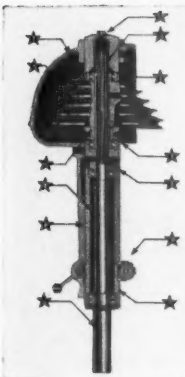
The unusual speed and cutting precision of this machine result from lead-screw control, which assures proper tapping speed and pressure at all times, and eliminates the variables involved in hand operation. The lead screw also greatly increases tool life by reducing wear and breakage of taps. **242-G**

IN LOW TEMPERATURE WELDING of Magnesium Alloys, Dow Metal with Castolin Eutectic Alloy #1900 is used for filling and adding metal on castings and parts which are broken, cracked, porous, or otherwise defective. For joining of magnesium sheets to castings, correcting machining errors, filling blowholes or defects.

This alloy gives welds which contain a very high amount of magnesium and aluminum and are therefore closely matching the parent metal. The welds show tensile strength, mechanical value, hardness and corrosion resistance entirely comparable to the parent metal itself.

EUTECTIC WELDING ALLOYS CO., 40 Worth St., New York, N. Y. **81-G**

Why Industry Prefers THE WALKER-TURNER 20" DRILL PRESS!



1 Double row ball bearing—for thrust and radial load.
2 Ball bearing near spindle center aids rigidity.
3 Ball bearings above and below pulley eliminates whip.
4 Ten spline spindle improves accuracy.
5 Aluminum alloy spindle pulley permits speeds above 5000 r.p.m.
6 One piece head casting, bored in line.
7 Pulleys and belt amply guarded, yet easily available.
8 Steel quill turned from bar, seats bored and rack milled in quill.
9 One piece feed pinion and shaft, with teeth cut on gear hobber.
10 One-shot lubrication—oil applied at one point only.
11 No. 2 Morse Taper Spindle Nose.
12 Power feed take-off pulley. Feed coordinated with spindle speed.

The sectional view above illustrates the careful design that provides an unusually smooth-running spindle in Walker-Turner 20" Drill Presses. These rugged production machine tools are in use in great numbers in war industries today. Due to their versatility, many have been applied in special tooling set-ups of various kinds. Simplicity of controls permits their use by unskilled and semi-skilled labor—an important point under present conditions as well as in the post-war period.

Send for descriptive literature

WALKER-TURNER CO., INC., 5614 Berckman Street, PLAINFIELD, N. J.

Furnished in bench, floor and multi-spindle models—with or without power feed. Capacity ¾" in steel, 1" in cast iron. Spindle speeds 260 to 2600 r.p.m.

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

PUBLICATION PREVIEWS

SALES AND TECHNICAL LITERATURE

Send Request on Company Letterhead

THE W. F. & JOHN BARNES CO., Dept. TDJ, Rockford, Ill., has compiled a 50-page loose-leaf data book made up of the six sections illustrated. These sections have been bound

individually and are available to all interested parties. Illustrations, diagrams and general data covering SH-75, SH-12 and SH-24 Self-Contained Hydraulic Sliding Head Units are contained in the data sheets that appear in Section 6. Multiple Drilling and Reaming Machines are illustrated and described in Section 1, and Boring and Facing Machines in Section 2. Section 3 covers Milling Machines and Section 4, Deep Hole Machines. Section 5 contains information on miscellaneous machines. **80-G**

ACCURATE, SENSITIVE, ADJUSTABLE measuring instruments that are used in maintaining size control and general testing are characteristic of the Ames line of gages, dial indicators and comparators. Ames Hundred Series Indicators are offered with shock absorbing wheel assemblies and when so equipped are marked "Shockless" on the dials. This patented wheel assembly is recommended for use where shocks and jolts may occur in testing and inspecting. The easy-reading dials on the Ames Dial Comparators amplify thousandths, half-thousandths, or tenths and indicate plus and minus values instantly. Size, thickness, roundness, flatness, height and other dimensions of objects in large quantities are compared quickly and without operator fatigue. Mechanics like the Ames Universal Test Indicator No. 22A because it is small and compact, easy to set up and adjust, can be used on numerous testing jobs, and with Hole Attachment can reach internal surfaces and places that are hard to get at. Catalogs on the above and Ames precision bench lathes, bench milling machines, and Rhodes shapers and slotters may be had by addressing the B. C. AMES CO., Dept. TDJ, Waltham, Mass. **189-G**

TRICO MICRO-CHEK—a visual indicator comparator gage, designed especially to facilitate inspection of close tolerance parts, permitting rapid and economical checking with advantage over the ordinary conventional gaging methods is the subject of an 8-page catalog issued by TRICO PRODUCTS CORP., Dept. J, Buffalo, N. Y. Fully illustrated descriptions of the Micro-Chek are presented. This rugged instrument, light in weight and not affected by oil, multiplies dimensions by as much as 200 times. It possesses extreme simplicity of design and construction, yet is so foolproof that it can be used by inexperienced inspectors with full assurance of accurate gaging of parts inspected. **539-G**

R & M MULTIPLE STOPS permit the more effective use of unskilled labor, according to a circular issued by ROBINS & McCONNELL, Dept. TJ, 155 E. 44 St., New York, N. Y. R & M Multiple Cross-Feed and Multiple Longitudinal Carriage Lathe Stops are precision tools and replace continuous micrometer measuring. One of their principal uses is to be found in connection with the modernizing of equipment for production purposes. A price list, diagrams and illustrations are included. **816-G**

CASE HARDENING AND LIQUID CARBURIZING is the subject of an interesting 24-page booklet issued by the AMERICAN CYANAMID & CHEMICAL CORP., Dept. J, 30 Rockefeller Plaza, N. Y. 20, N. Y. Liquid bath carburizing provides protection from oxidation of the steel surface during the transfer from carburizing media to quench without the necessity of expensive and intricate mechanical equipment. A few of its primary advantages include rapid heat transfer, uniformity of heating, accuracy of temperature control, uniformity of penetration, reduction of distortion and reduction in over-all carburizing time. Recent new developments, and improvements in formulation and operating technique of well-known and established products now make available materials for liquid carburizing which provide speed of penetration, uniformity of case depth and hardness and economy of operation over the range of .001" to .150". Information contained herein may show you how to improve your company's product by a more uniform depth of penetration, a special nitrided surface or a substantial reduction in processing time. **632-G**

ELECTRIC INDUSTRIAL TRUCKS and Tractors are described and illustrated in a general catalog recently released by the CRESCENT TRUCK CO., Dept. T-1, Lebanon, Pa. These tractors are designed to furnish low cost, trouble-free, tractive power. Type "NA" Straight Platform Truck with a 4000 and 6000 lbs. capacity are super utility trucks for all around service. The large wheels, full automotive type semi-elliptic spring suspension and maximum load helper leaves, permit the handling of heavy loads over rough roadways. The large platform area is adaptable to bulky loads, dump bodies, cranes and other auxiliaries. The Lo-Lif-Toer is the subject of a 4-page bulletin. This economical industrial truck hauls and tows at from 4 to 6 mph. The operator lifts, carries, lowers and steers without dismounting. **559-G**

NORBIDE MOLDED SHAPES are being used for a wide variety of gages and measuring devices and among these are: plug, ring, keyway, snap and radius gages, inserts, gage blocks, micrometers and indicator points. In grain or powdered form, Norbide is the hardest manufactured powder, but it is in its molded form that it finds special application in the manufacture of gages and measuring devices. If care is used in handling Norbide gages, they will prove economical as "go" and "not go" working gages and as inspection gages where tolerances are in tenths of a thousandth of an inch or where, because of rapid wear, gage costs are considered excessive. This and additional information is included in a 10-page booklet issued by the NORTON CO., Dept. D, Worcester 6, Mass. **545-G**

HOLE PUNCHING UNITS are dealed in a 28-page booklet recently issued by WALES-STRIPPIT CORP., 355 Payne Ave., N. Tonawanda, N. Y. A self-contained holder carries the punch, die and stripping mechanism and eliminates the necessity of attaching punch to press ram. This design also assures permanent alignment of punch and die. Each Wales Unit is independent to provide instant setting, removing or resetting on press brake rails. Unlimited pattern set-ups are quickly and easily made by locating and locking a group of units in exact position according to master pattern. **60-G**

"HEAT TREATING TOPICS"—The first issue of a new bulletin for plant owners, superintendents, foremen and purchasing agents, has recently been published by REX & ERB, prominent commercial heat treaters, located in Lansdale, Pa. The new publication, which will be issued at regular intervals, is of special interest to those responsible for work involving heat treating, and is available without charge to persons interested. REX & ERB also have laboratory facilities for handling consulting work on war and post-war problems. They are now serving manufacturers throughout the United States and Canada on routine and special heat treating work. **813-G**

DRILL JIG BUSHINGS is the subject of Catalog No. 243 published by the ACCURATE BUSHING CO., Dept. D, Garwood, N. J. A brief description of each type of bushing is given on each table together with the most common applications. Headless Press Fit Bushings, Fixed Renewable Bushings, Headless Liners, Slip Renewable Bushings, and Head Press Fit Bushings are diagrammed and illustrated. Headless press fit bushings are used whenever it is desirable to have the bushing flush with the jig plate; also in those cases where the distances between centers of the holes to be drilled are too short to permit the use of bushings with heads. **811-G**

DATA ON Hydraulic Power Units, Hydraulic Test Benches, Special Machinery and Presses is included in a first eighteen page section of a new catalog dealing with many phases of hydraulics as applied to machine tools and aviation just released by HYDRAULIC MACHINERY, INC., Dept. D, 12825 Ford Rd., Dearborn, Mich. It also contains a preface which shows the facilities of this company for the tooling as well as the building of special machinery. **32-G**

DOING TOUGH JOBS *Fast*

takes the Speed and Stamina of

SKILSAW TOOLS!

EVERY MAN COUNTS FOR MORE USING SKILSAW TOOLS!

It's the *punch* and *power* of SKILSAW TOOLS that makes them favorites in War Plants today. It's the *punch* and *power* of SKILSAW TOOLS that will make them favorites with you! SKILSAW TOOLS are rugged, dependable, *faster-working* . . . they'll bust tough bottlenecks, boost production and stand up longer under hardest usage. And SKILSAW TOOLS are light, compact, perfectly balanced . . . they'll handle easier, do more jobs and do them better.

Want to see for yourself how SKILSAW TOOLS can save money, minutes and manpower in your own plant? Ask your distributor for a demonstration of SKILSAW TOOLS today!

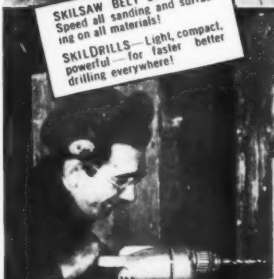
SKILSAW, INC.

5061 Elston Ave., Chicago 30, Ill.

Sales and Service Branches in All Principal Cities

SKILSAW BELT SANDERS — Speed all sanding and surfacing on all materials!

SKILDRILLS — Light, compact, powerful — for faster better drilling everywhere!



Special Tool Maintenance Manual

There's a big Special Section on the Care and Operation of Electric Tools in the NEW SKILSAW CATALOG! Full of illustrations and valuable suggestions on How to Get the Most From Your Electric Tools in Wartime!

SEND NOW FOR YOUR FREE COPIES!

SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

FOR THOSE WHO HAVE ONLY RECENTLY experienced the need of heat treating, a bit of industrial furnace background is presented in a pocket-size booklet entitled, "The Heat Treating Furnace" published by SURFACE COMBUSTION, Dept. TD, Toledo, O. It is the answer to "tomorrow's heat treating furnace" for those who have the tremendous job of converting war production lines to products for peace. No plane flies, no gun is fired which does not owe something to heat treating. Almost every metal part, not only in our war machines, but in the machines that make them, is dependent upon one or more heat treating processes. The furnaces of the future will embrace many new factors, including the analysis of the metals which are to be treated. Processes like dry pickling, dry cyaniding and gaseous quenching are already available. **810-G**

A WELL-ILLUSTRATED CATALOG, 43C, in which the prices of standard tools and blanks have been reduced, has just been issued by KENNAMETAL INC., 500 Lloyd Ave., Latrobe, Pa. The first section contains specifications and prices of standard tools together with line drawings and halftones showing representative applications. The second section is devoted to similar information on typical tools, including new lines of solid round and solid square Kennametal precision boring tools; also information on standard and non-standard blanks, and Kennametal specialties, such as lathe and grinder centers, balls, gage tips, etc. The third section deals with the origin and characteristics of Kennametal, how to select the proper grade, how to specify and order tools and blanks, information on the several types of chip breakers, instructions on brazing blanks to tools shanks, proper grinding methods, and the milling of steel with carbide tipped cutters of simple design. **33-G**

PUNCH
SMALL
STAMPINGS
ON A SMALL
PRESS
Faster!
Cheaper!
and with large
Man-hour Savings!
DIEBEL Hi-Speed STAMPING PRESS
You waste precious time, run up excessive power and labor costs, and lose vital man-hours when you use small dies on a big press. The Diebel Hi-Speed Press is compact, operated by women or unskilled men workers, punches out as many as 550 pieces a minute, uses little power, small floor space. The Diebel Press is in tune with the times.
Write for catalog
DIEBEL Hi-Speed Automatic PRESS 550
DI MACHINE CORP.
DIVISION OF DIEBEL DIE & MFG. CO.
3653 N. LINCOLN AVE. CHICAGO

A DRILL CHUCK THAT HOLDS—and without the use of bushings, has been perfected by THE ALCO TOOL CO., 552 Birdseye St., Bridgeport, Conn. It will fit any screw machine and, by means of a wrench only, is quickly adjustable to any size drill within its range. The Alco Tap Holder, being tapered to a small diameter, provides ample clearance for rapid cross slide tool movement. This feature speeds up cam timing thus reducing the machining time for each part and proportionately increasing production. The Alco Acorn Type Hollow Mill Holder does not depend on thread fit for concentricity. Its patented internal bearings, which are ground entirely true with the shank, result in cutting on all lands of the hollow mill—assuring long life. Further information my be had by writing for Catalog No. 4. **180-G**

Look at these typical jobs handled better on the SUNNEN PRECISION HONING MACHINE

Production Increased — Time Saved!

Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Closer Tolerances — More Accurate Work

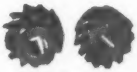
Cast Iron Valve Stem Guide. ½ to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Errors Corrected — Alignment Maintained

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Compressor Yoke. Alignment maintained and better finish produced.

Super-Smooth Finish!

Bearing. A very small part. 2 micro-inch finish necessary.

Carburetor Idler Valve Jet. Hole is honed after reaming for smooth action.

Carburetor Idler Pump. Smooth, straight-line finish in blind hole prevents piston leakage.

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

The basic price of the Sunnen Precision Honing Machine is only $195! And operating costs are low.

No jigs or fixtures needed — work can be held in the hands.

Wide range — handles any internal diameter from .185" to 2.625".

Does Not Require Skilled Labor!

Here's good news — girls in 'teens can be trained to handle jobs in "tenths" in a few hours.

Sunnen guaranteed accuracy assures fewer rejects and absolute interchangeability of parts.

Write for free bulletin giving complete information.

SUNNEN PRODUCTS COMPANY

7947 Manchester Ave., St. Louis, Missouri

Canadian Factory: Chatham, Ontario

SUNNEN

AN INTERESTING BOOKLET DEDICATED TO Naval Architects and Engineers concerned with the design, installation and operation of mechanical remote controls has been published by BROOKS EQUIPMENT CORP., 92 West St., N. Y. C. The two main divisions of this booklet cover the Consolidated Hinged Joint for shafts, with positive and effective operating range at angles from 0° to 92° in any one given plane and the revolutionary Brooks Universal Joint with positive and effective operating range at angles from 0° to 360° in any plane. Experience has demonstrated that these joints will overcome many of the difficulties experienced with bevel and mitre gears and other types of control shaft joints. Numerous photographs and diagrams depict various Consolidated Hinged Joint applications. **218-G**

THE COMPLETE STORY OF THY-MO-TROL. G. E.'s pioneer electronic drive for providing and controlling adjustable-voltage power from a-c lines thus making possible the utilization of the inherent advantages of d-c motors, is contained in an attractive new 40-page bulletin (GEA-4025) recently issued by the GENERAL ELECTRIC CO., Dept. D, Schenectady, N. Y. The first part of this well-illustrated bulletin explains the unique Thy-mo-trol drive in considerable detail, describes its functions and lists its advantages. Typical applications listed include: installations on grinders, turret lathes, drill presses, conveyors and form-and-thread milling machines; and on machines for testing tachometers, magnetos, propeller governors, and the tensile strength of various materials. The second section is devoted to a complete, easily understood, technical explanation of the Thy-mo-trol drive's operation. **77-G**

DEEP... LEGIBLE MARKING!
... with Matthews New No. 204
MARKING MACHINE
MARKS ROUND OR FLAT PARTS
A range of parts up to 6" in dia. or thickness . . . legibly marked with this NEW General Purpose Marking Machine Round parts, marked with flat dies . . . flat parts marked with roller dies
Write today for literature!
JAS. H. MATTHEWS & CO.
3896 Forbes Street Pittsburgh 13 Pa.
Branch Plants
New York, Boston, Chicago, Philadelphia, Newark, Syracuse
District Sales Offices
Cleveland Detroit Hartford Birmingham

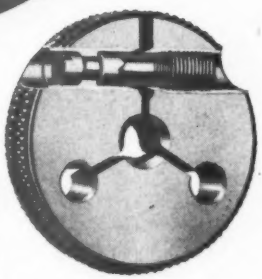
FLAT — PARALLEL — ACCURATE. Dearborn Gage Block surfaces will adhere exactly as steel gage blocks when wrung together. In order to reduce stresses in the steel of these blocks to a minimum, the size designation, insignia and other markings are etched on each block rather than stamped. Small rectangular type blocks which have the size designation on the gaging surface are now etched close to one end instead of in the center as center etching might weaken the gage blocks sufficiently to allow warpage. Chromium Plated Gage Blocks of all types are offered individually or in working, inspection or laboratory sets. Descriptions and prices of complete sets of Rectangular Type gage blocks produced and carried in stock are contained in a 24-page catalog issued by the DEARBORN GAGE CO., Dept. D, 22038 Beech St., Dearborn, Mich. Sets containing a larger or smaller number of gage blocks can be furnished upon special order. **139-G**

. . on PERFEX STANDARD THREAD PLUG and RING GAGES

The PERFEX GAGE & TOOL COMPANY carries 75% of standard thread plug and ring gages in stock to insure a 48-hour delivery service.

This announcement is in keeping with PERFEX's new "stepped-up" production schedules. It is just another reason why both large and small manufacturers have come to recognize PERFEX as a young progressive company that has made accuracy its creed for better work.

Because the PERFEX GAGE & TOOL COMPANY has specialized in the manufacture of standard thread plug and ring gages it is able to fulfill its promises on deliveries to those manufacturers who are urgently in need of thread plug or thread ring gages.



The above illustration shows a thread ring gage and a cut-away view of its locking device. Like all PERFEX gages these ring gages are made under the personal supervision of men who have had years of experience in precision gage and tool manufacture. Each PERFEX gage is checked and rechecked in air-conditioned inspection rooms before they are shipped. This insures extreme accuracy and eliminates costly delays in rejects by the customer.

Wire or write your order today, sending complete specifications and blueprints.

ACCURACY PERFEX OUR CREED

PERFEX GAGE and TOOL CO.

3604 GAYLORD DETROIT, MICHIGAN

THE AMERICAN STANDARD SAFETY CODE for the Use, Care, and Protection of Abrasive Wheels is the title of a 64-page booklet issued by the AMERICAN STANDARDS ASSOCIATION, Dept. TD, 29 W. 39 St., N. Y. C. The tables, in this 1943 revision, of critical speeds for mounted wheels and points and the rules covering their use are the result of extensive research conducted by the Grinding Wheel Manufacturers Association. The new rules covering inserted nut wheels and plate mounted wheels are drawn from the collective experience of the various grinding wheel manufacturers. Specifications are included for drawn steel protection hoods for portable grinders. These allow the use of lighter weight guards than were called for in the 1935 issue. The section on speeds has been revised to make permissible the higher speeds which have become standard practice on thread grinding and certain other specific operations and which were formerly permissible only as an exception to the basic rule. The basic rule on speeds has been revised so that higher speeds may be used where necessary but only under proper control. **793-G**

PRESERVE HARD TO REPLACE EQUIPMENT by protecting office carpets and covering worn spots with easy roll chair mats suggests a bulletin recently issued by W. H. LONG CO., 430 N. Clark St., Chicago, Ill. Production time can be saved by attaching a No-Ink Top to your old drawing board. It resists chipping like rubber and is washable as glass or porcelain—dispenses with thumb tacks and thumb tack holes and eliminates manila paper. In addition to a non-skid linoleum desk top to cover your scratched desks, the bulletin also mentions ideal furniture guards for covering slivered edges. They're easy to apply and require no wetting or gluing. A new polishing wheel adhesive called "Stikum" is recommended for speeding up work and cutting operating costs as well. **796-G**

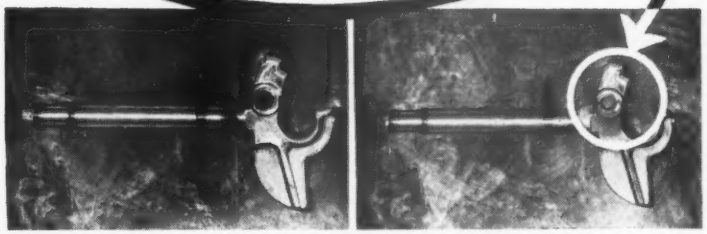
Free TRIAL IMMEDIATELY
on ZAGAR COLLET FIXTURES
The Production-Increasing Tools for milling, drilling, tapping, slotting and like operations
Simplicity of operation, accuracy, rugged construction and simple design assure greater and more accurate production by less experienced operators. We will ship to any reputable concern on a free 30-day trial. "No convince, no pay." Fair enough? Order today.
Zagar Holding Chucks come in 1" and 2" sizes.
Zagar Indexing Chucks come in 1" and 2" sizes.
Get Bulletin D-1
ZAGAR TOOL, INC.
23880 Lakeland Blvd. Cleveland, Ohio

MARKING DEVICES, metal checks and tags and allied products is the theme of Catalog No. 37 published by THE DICKEY-GRABLER CO., 10332 Madison Ave., Cleveland, O. Steel hand stamps for stamping concave or convex surfaces such as tubing, type, piston rods, and axles are illustrated. These stamps are carefully machined to the shape or curve of the article to be stamped. Straight Line Type Holders are made either for hand or machine use, and for one or more lines of type. Automatic Numbering Machines for depressed characters on metal made with any size figures up to and including ½" and any desired style of figures are shown. **271-G**

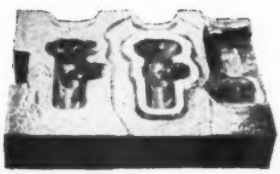
Do You Know..

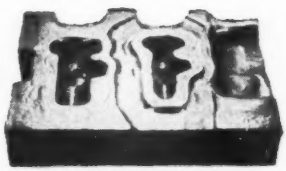
THAT THE LIFE OF YOUR FORGING DIES CAN BE EXTENDED?

It's being done every day by welding with Eureka "Drawalloy" Welding Electrodes. Tons of forging dies and untold man-hours are saved in eliminating re-sinking operations.



Boss on 1200 lb. forging block replaced by welding with "Drawalloy" Electrodes.





Spalled contour on forging die rebuilt with "Drawalloy" Electrodes.

The Welding Equipment & Supply Company's Eureka "Drawalloy" Welding Electrodes have fulfilled the long felt need in the forging industry for welding electrodes that would *efficiently* rebuild, to original dimensions, the contours of forging dies that have heat checked or spalled.

This remarkable development of "Drawalloy" electrodes now makes it possible to rebuild defective forging dies so that all welded deposits closely match the characteristics of typical forging block steel. Thus the welded areas and those adjacent to them can be machined to the original dimensions of the forging die.

Eureka "Drawalloy" Welding Electrodes are available in types No. 240 and No. 340, that provide a hardness range of deposits from 240 to 380 Brinell.

When your forging dies become heat checked or spalled, don't scrap them—order Eureka "Drawalloy" Welding Electrodes today and prove to yourself how you can save both time and money with "Drawalloy".

★ *Send for our catalog listing Eureka "Drawalloy" Electrodes as well as our complete line of Tool Steel Welding Rods* ★

DISTRIBUTORS IN THE PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

WELDING EQUIPMENT & SUPPLY CO.

223 LEIB STREET • DETROIT, MICHIGAN

THREE NEW SLIDE RULES—one for the professional draftsman, one for the apprentice draftsman or student and also a handy five inch pocket slide rule have just recently been made available by THE FREDERICK POST CO., Dept. T, Box 803, Chicago 90, Ill. All three rules contain the A, B, C, D, CI, K, S, L and T scales. With exception of the apprentice rule which has a painted face, they are celluloid faced. These rules, which have been produced as an emergency measure to meet the tremendous demand, are well constructed, accurate slide rules and come equipped with a case and instruction sheet on the operation of the slide rule. This news should be of interest to engineering, drafting, accounting, estimating and sales departments. Further details may be had by addressing the company. **797-G**

RIEHLE HARDNESS TESTERS are presented in Catalog M, published by AMERICAN MACHINE & METALS, INC., Riehle Testing Machine Div., Dept. TDJ, E. Moline, Ill. The Riehle Hydraulic Brinell Hardness Tester incorporates inertia reducing springs which eliminate the possibility of overshooting the load on the penetrator as the accumulator weights are moving upward before the full required load is applied to the penetrator. As the accumulator weights continue their upward travel, the compression springs go out of action so that the load applied is a function of the accumulator weight alone. Catalog U contains information on Universal Hydraulic Testing Machines. These machines are springless and are load measured through linear displacement of dead weight automatically balanced. **814-G**

TWO WAYS TO FIND OUT

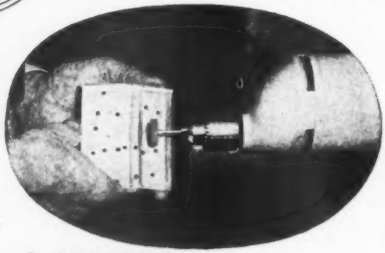
why Brightboy gives you

FASTER, FINER

DE-BURRING • FINISHING • POLISHING

Look at Brightboy through a microscope. You'll see abrasive impregnated clear through a piece of resilient rubber. Both rubber and abrasive *combine* in an all-in-one de-burring, finishing and polishing action. Try Brightboy under actual working conditions. Prove that it bridges the gap between a grind and a buff—saves operations and time.

Ask your distributor or write us for Methods and Applications booklet and prices. Brightboy field representatives are at your service.



BRIGHTBOY IND. DIV.
Weldon Roberts Rubber Co.
Newark, N. J.

WELDON ROBERTS
Brightboy

ANNOUNCED FOR THE FIRST TIME is DoAll's entry into the powder metallurgy field with the manufacture of hydraulic presses. A complete line of new industrial tools covering many phases of industrial production is contained in Catalog No. 102 issued by THE DO-ALL CO., Dept. TD, Des Plaines, Ill. Included in the catalog is the "Speedmaster", a variable speed pulley with a six-to-one ratio which gives a greater infinite range and wider adaptability to machine tools. Their line of gage blocks and gage inspection laboratory sets for measuring and establishing control of precision measurement is shown. DoAll steel ink with its satin-like lustre prevents glare and will not shrivel, check or crack. Also included is data on contour and high speed sawing and filing machines with their many attachments for shaping and fabricating all types of materials. In the field of coolant oils and lubricants are shown DoAll Saw Eez, cutting oils and coolant oils. **130-G**

LATROBE

TUNGSTEN HIGH-SPEED *Steels*

LATROBE offers a complete series of straight tungsten high speed steels, each of which is the product of rigidly controlled metallurgical processes, resulting in the finest quality steels obtainable in their field. They differ primarily in vanadium content, thus giving you a choice of steels for varied production requirements.

ELECTRITE No. 1

Electrite No. 1
A general purpose tungsten high speed steel, (1% Vanadium) for use where maximum toughness is desired.

ELECTRITE No. 19

Electrite No. 19
A tungsten high speed steel with 2% Vanadium for greater wear resistance and improved production.

ELECTRITE *Vanadium*

Electrite Vanadium
The latest development in tungsten high-speed steels containing over 3% Vanadium and affording maximum wear-resistance.

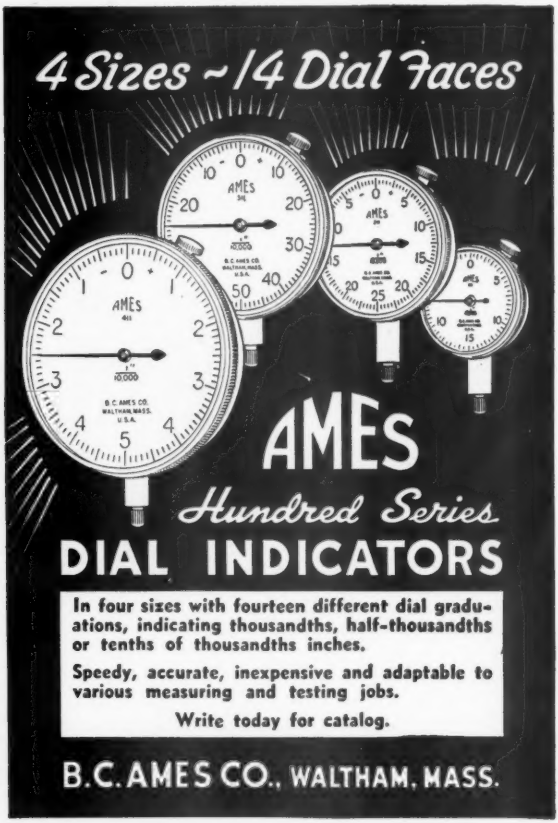
Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT •• LATROBE • PENNSYLVANIA

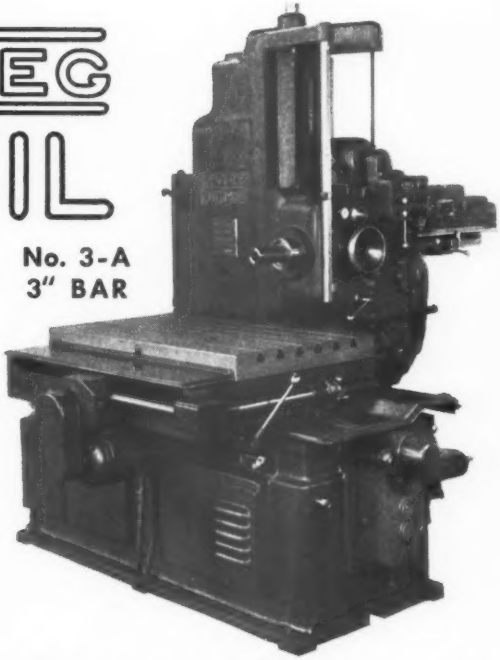
THE CLINOMETER, a new pendulum type instrument for checking with greatest accuracy inclinations towards the true horizontal or vertical, is finding many applications in the aircraft industry. It eliminates the use of spirited levels and protractors mounted on work benches and is used for such operations as testing inclined surfaces of airplane wings and the pitch angles of propeller blades, setting up of work tables, and the levelling of machine tools. The rotor of the Clinometer has been designed to accurately repeat within a limit of 7½ seconds. An outstanding advantage of the instrument is that it can be locked, hence it is not necessary to take the reading while the instrument is in the measuring position. Revolutionary in the field of vises is the Wilton precision bench vise which provides interchangeably fitted parts of high precision and greater holding power. A new Resistal Industrial Goggle made for comfort and safety for general use against flying particles along with a new Welder's goggle which is lightweight and provides ample ventilation is now available. Also of interest is the Universal Toolholder which is adaptable to any and all lathe operations. Further information on all these specialties may be had by writing the ACME TOOL CO., 196 Church St., N. Y. C. **69-G**

SINSZINE—a new product for those who have accurate, careful and rapid drilling in glass to perform, as in the optical trade, has been developed by E. KARELSEN, INC., 130 W. 45th St., N. Y. C., designers and producers of diamond cutting tools. Possessing a property that assures rapid, smooth cutting, it lubricates and provides greater tool life. It also acts as a cooling agent for the tool and prevents smears or a greasy deposit. By means of a cloth, any glass to which Sinszine has been applied can be easily and quickly wiped off, leaving a brilliant lustre—like a diamond. It is put up in 4 oz. containers with applicator, also pints, quarts and gallons. Further information may be had by writing the company. **798-G**

SPECIAL HIGH SPEED STEEL CUTTING TOOLS is the subject of a 60-page handbook just released by U. S. TOOL & MFG. CO., Dept. TD, 6906 Kingsley, Dearborn, Mich. Included are illustrations and line drawings of high speed steel cutting tools such as milling cutters, forming tools, end mills, reamers, counterbores, back-off, gang and many other types of miscellaneous special cutters. Those who do not have engineering facilities for designing tools will find this new handbook helpful in figuring out the type of special milling cutters that may be needed. **812-G**


4 Sizes ~ 14 Dial Faces
AMES
Hundred Series
DIAL INDICATORS
In four sizes with fourteen different dial graduations, indicating thousandths, half-thousandths or tenths of thousandths inches.
Speedy, accurate, inexpensive and adaptable to various measuring and testing jobs.
Write today for catalog.
B.C. AMES CO., WALTHAM, MASS.

DEVLIEG JIGMIL



No. 3-A
3" BAR

To more accurately and speedily serve the broad field needing a machine having

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THE SPACING ACCURACY OF A JIG BORER

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THE PERFORMANCE QUALITIES OF A MILLING MACHINE

• • •

THE CONVENIENCE AND FLEXIBILITY OF A HORIZONTAL BORING MILL

A PRECISION MACHINE

Featuring

NEW SPEED OF OPERATION

NEW ADVANCED FINGER TIP CONTROLS

NEW STANDARDS OF EXCELLENCE OF BORED HOLES

NEW ACCURACY IN MILLING

AUTOMATIC TABLE RETRACTION AND REPOSITIONING

Many machines in operation show 75% greater average daily productivity and improved dependability for precision.

Write for Circular

DEVLIEG MACHINE COMPANY
452 FAIR AVENUE, FERNDALE (DETROIT), MICHIGAN

DEVLIEG MACHINE TOOLS

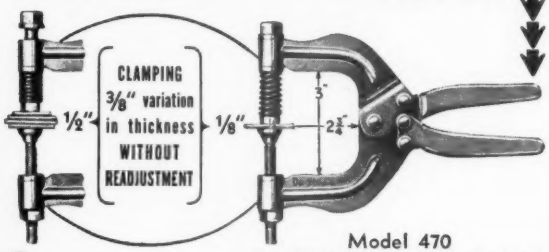
AIRCRAFT TOOLS, INC., Dept. TD, 750 E. Gage Ave., Los Angeles 1, Calif., is offering an elaborate, loose-leaf catalog covering their complete line of aircraft tool specialties. The Aerocraft Micrometer Stop Countersink, constructed to give extreme accuracy, is full ball bearing with cutting depth controlled by making a micrometer setting and locking the barrel into position. Cutters are of the three spiral flute type with highly polished flutes, available in 1/16" and 7/8". Back Countersinks and Back Spotfacers possess a quick action Bayonet type lock which eliminates threads and gives tighter grip and faster action. Designed for rapid handling of screws and bolts, as well as burring drilled holes, the Speedriver is proving of great assistance in speeding aircraft production. A part of the complete kit is an adapter that permits use of the bits with power driven tools. The handle of the Speedriver is rugged and full swiveling, with a positive fitting jaw for the bits. **178-G**

SKILSAW PORTABLE ELECTRIC TOOLS as applied in war production and construction are presented in a new catalog just published by SKILSAW, INC., 5061 Elston Ave., Chicago 30, Ill. Included is a special section entitled, "How To Get The Most From Your Portable Electric Tools". This new Skilsaw Catalog and War-time Maintenance Manual should be of value to purchasing agents, engineers, production and maintenance men. **709-G**

A COORDINATION OF ONLY FIVE PARTS—shank, adjustable nut, universal float, cap and sleeve comprise the Empire Floating Tool Holder. The moving parts ride on rollers and thus contribute immeasurably to making the members anti-friction—producing smoother running with more perfect alignment. It will permit the reaming of holes with close tolerances, with the first hole reamed to size. Further information is available from the EMPIRE TOOL CO., Dept. T, 8774 Grinnell Ave., Detroit 13, Mich. **554-G**

IT'S A KNOWN FACT that clean glass will admit 30% to 60% more light than dirty glass. This greater light admission is important in any factory, especially during the winter months. Periodical cleaning of factory windows will remove the grime and film, thus reducing costs, improving working conditions and increasing output. All of these factors are doubly important during the war effort. A chemical compound called Saf-T-Klenz has been widely used for the above and is also recommended for removing iron rust, lime deposit, water stains, soap oils, body grease and discolorations from showers and wash rooms. Further information may be obtained by writing to the BERMAN CHEMICAL CO., Dept. TD, 356 Tenth St., Toledo, O. **207-G**

Now You Can Clamp Dimensional Variations Without Readjustment



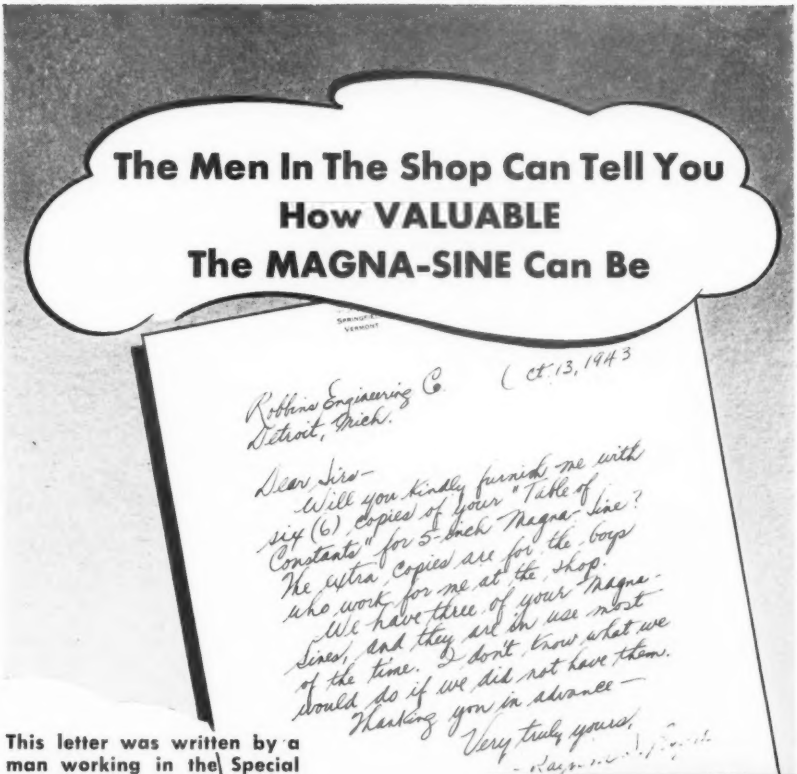
Model 470
DE-STA-CO *Portable* **CLAMP**
With Pressure-Matic Feature

"Pressure-Matic" . . . a De-Sta-Co feature, provides up to 3/8" automatic adjustment of clamping thickness. Thumb screw and lock nut gap adjustment. Used in riveting, drilling, welding, gluing, sawing, routing and assembly operations. Swivel foot provides angular clamping. Spindles copper-plated against welding spatter. Quicker, easier than "C" clamps. Smaller sizes available.

Send for Bulletin

DETROIT STAMPING CO.
Established Over 25 Years
344 Midland Ave • Detroit 3, Mich.

The Men In The Shop Can Tell You How VALUABLE The MAGNA-SINE Can Be



Springfield Vermont

Oct. 13, 1943

Robbins Engineering Co.
Detroit, Mich.

Dear Sirs—
Will you kindly furnish me with six (6) copies of your "Table of Constants" for 5-inch Magna-Sine? The extra copies are for the boys who work for me at the shop. We have three of your Magna-Sines, and they are in use most of the time. I don't know what we should do if we did not have them.
Thanking you in advance—
Very truly yours,

This letter was written by a man working in the Special Tool Department of one of the best known of the New England machine tool manufacturers. Like hundreds of other shop men, he knows first hand that the Magna-Sine makes possible faster, more accurate angular set-ups.

Check with any machine operator who has used the Magna-Sine or any inspector who has used the Robbins Sine Plate (built on the same principles but non-magnetic) and you'll realize how they speed up the production of any angular grinding work. Then let us send you complete information.

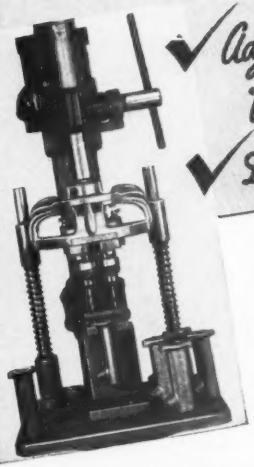
ROBBINS ENGINEERING COMPANY
318 MIDLAND AVENUE • DETROIT 3, MICHIGAN

RADIAC MOUNTED points and mounted wheels is the title of an 18-page booklet issued by A. P. DESANNO & SON, INC., Dept. 464 Wheatland St., Phoenixville, Pa. Radiac Mounted Points and Wheels are manufactured in two types of cutting materials—Aluminum Oxide and Silicon Carbide. To insure safety for the operator and to provide a rigid foundation for the abrasive material, all Radiac Mounted Points and Wheels are mounted on a specially designed steel mandrel. It has a small flat milled on one side and fits into a similar shaped hole in the wheel. The mandrel is then attached by a special cement of great adhesive strength. This ingenious manner of mounting prevents slippage or turning of the point or wheel on the mandrel even when subjected to heavy duty. **262-G**

AN AIR OPERATED COLLET HOLDING FIXTURE for precision chucking on machine tools is the theme of a 4-page pamphlet describing and illustrating The Red-E-Air Chuck manufactured by the RED-E-AIR CHUCK CO., 606 W. Washington Blvd., Chicago 6, Ill. This collet air chuck is an ideal tool for holding parts for drilling, milling, slotting, burring, chamfering, boring, counterboring, tapping, threading, reaming and other work where the machine operation should be concentric with the chucking surface. By the use of the foot operated valve, the operator's hands are free to load and unload, thus reducing fatigue and cutting unproductive time to a minimum. A special introductory trial offer together with prices and specifications are listed. **794-G**

COMPUTING ANGLES IS NOW A SPEEDY OPERATION when using the Studler Angle Computer states a six-page bulletin issued by THE ANGLE COMPUTER CO., Dept. D, 5720 Melrose Ave., Los Angeles 38, Calif. This instrument simplifies lay-out of die work, survey of castings and inspection of precision-machined parts in a fraction of the time required by the sine bar method. With this instrument, only one set-up of the work is required since its surface plate may be rotated 360 degrees about each of three mutually perpendicular axes. Further information may be had by addressing the company. **100-G**

TWO SPINDLE
Adjustable
DRILL HEADS
Drill Two Holes At Once



✓ *Adjustable Centers from 1/2" to 6"*
✓ *Drill Capacity 0" to 5/8"*

Sleeve and overarm types . . . in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from ½" to 6".

Send for bulletin.

LINDERME MACHINE & TOOL CO., INC.
12250 Coyle Ave., Detroit 27, Mich.

"MODERNIZE YOUR SHOP" is the title of an interesting bulletin recently issued by THE CINCINNATI PLANER CO., Dept TJ, Cincinnati, O. The Cincinnati Hypro Frog and Switch Planer is designed for railroad work and will withstand the heaviest cutting. This planer has a double length enclosed bed with extra deep housing cheek bearing to the bed. A full length box section arch adds to the rigidity of the housings. The table is of greater depth and is provided with full length hold-down gibs. For a complete description send for Catalog 90. **55-G**

Here's an outstanding time and money saving tool for your parts numbering operations—*the Mercury Interchangeable Type Holder.* It provides for fast, accurate and fully legible numbering of metal parts, eliminating errors, rejects and the time normally consumed in using single-character dies.

HERE'S ALL YOU DO:

Unlike ordinary one-character dies, which must be used separately, the Mercury holds the entire part number—up to 16 digits, if needed. You simply "load" the tool with the correct part number and snap the cover shut. *Thereafter, as many duplicate parts as desired can be quickly and neatly stamped with just a single blow of the hammer for each part!* Time normally lost using a separate die for each separate digit is saved, and overlapping, wrong sequence and illegible numbering are eliminated.

The Mercury Type Holder has many more outstanding features you should know about. Type is quickly interchangeable for different part numbers . . . compactness aids in stamping smaller parts . . . all-steel machined construction insures long life, cuts replacement needs. Hardened and ground hand-cut steel type is available in a full range of sizes. Full details, including ordering data and specifications for both hand and press style holders, are contained in descriptive bulletin mailed free on request. Write for your copy today—ask for Mercury Bulletin 1-D

Immediate Delivery

MERCURY METAL DIE AND LETTER CO.

546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

THE TABER ABRASER, an efficient and accurate testing machine for evaluating resistance of surface finishes to rubbing abrasion, is the subject of Bulletin 4012 issued by the TABER INSTRUMENT CORP., Dept. T, N. Tonawanda, N. Y. Its range of application includes nearly all paint, lacquer, electroplated and plastic surfaces. Textile fabrics ranging from sheer silk to heavy upholstering can be readily tested by using the supplementary equipment furnished with the instrument. The ease and simplicity of making an abraser wear test is clearly described and illustrated. **795-G**

FACTS ABOUT Bay State Koolpore Grinding Wheels are contained in a 4-page leaflet issued by ABRASIVE PRODUCTS CO., Dept. T, Westboro, Mass. Included among their features are cooler and faster cutting, faster stock removal, no chip jamming, greater clearance, thus permitting broad contacts and resulting in less distortion of thin metal sections during surfacing operation. The outstanding feature of all Bay State Koolpore abrasive products is the large pore spaces that produce wheels that assure heavy cuts and fast removal of metal without burning. **808-G**

REX SPEED PRIME PUMPS are described in Bulletin 433 recently published by the CHAIN BELT CO., Dept. TD, 1600 W. Bruce St., Milwaukee, Wis. In addition to complete information concerning the mechanical parts, construction and operation of the pump, the catalog also includes specifications and capacity charts to aid in pump selection. These pumps are made in capacities ranging from 3000 gallons per hour to 125,000 gallons per hour. Applications are found in many industries and for pumping many fluids. Their chief use is for dewatering purposes, and for this service they offer many advantages—the outstanding of which is their positive self-priming feature. **815-G**

New!
KNOCK-OUT
UNIVERSAL
CARBIDE
TOOL GRINDER
HANDLES ALL GRINDING OPERATIONS NECESSARY ON CONVENTIONAL SINGLE POINT TOOLS
STURDINESS, ACCURACY, DEPENDABILITY, SPEED, AND ECONOMY DISTINGUISHES THE K-O CARBIDE TOOL GRINDER
NEW LITERATURE JUST OFF THE PRESS IS YOURS BY WRITING FOR BOOKLET NO. CTG-43-TD
KNOCK-OUT
K.O.LEE COMPANY
ABERDEEN, SO. DAKOTA

A SERIES OF CATALOGS describing their products has been published by the BELL & GOSSETT CO., Dept. TDJ, Morton Grove, Ill. No. F-339 features their Hot Water Heating Specialties which include water heating systems and electrical controls. No. U-443 includes data on Instantaneous Water Heaters which are ideal for industrial plants or wherever large volumes of hot water are required continuously for service water supply or process work. No storage tank is required, thereby saving space. No. OC-743 covers the subject of Oil Coolers and Heat Transfer Equipment along with numerous diagrams and photographs. No. CP-843 is entitled: Centrifugal Pumps Type "W". Included is data required for pump selection and engineering. **206-G**

The Simmons Machine Tool Corporation has received a second white star for its Army-Navy "E" flag.

Safeguard Production · Reduce Rejections · ·
Avoid Delays · Assure Interchangeable Work · · ·

At low Cost with the

SCHERR INSPECTION UNIT

● This inspection unit meets today's need for accuracy. Available now at a price within the reach of practically any shop, it will enable you to check Plug Gages, cylindrical ground work, pins, pivots, bearings, gage blocks, etc.

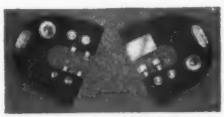
THE SCHERR INSPECTION UNIT INCLUDES:

1. The Scherr Comparitol—a measuring instrument which makes it possible to check work at 1/10,000", .004" plus and minus.
2. A set of 34 gage blocks, which make up 80,000 combinations in steps of 1/10,000".
3. An Optical Flat for checking lapped surfaces.
4. A specially constructed gage case for holding gage blocks and other tools and gages and which serves also as a base for the Comparitol.

Scherr Inspection Unit as described above—Price $395.00. Attachments such as V blocks, back stops, various sizes of measuring tables available at extra cost.

Write for full and complete information.

SCHERR MACHINISTS' TOOL SPECIALTIES



ATLANTIC ADJUSTABLE LIMIT SNAP GAGES—for accurate check-up, without having to depend on operator's skill. Sizes to 6".

MAGNI-RAY—a wide field illuminated magnifier for close inspection of work and operations. $18.50 List.

SPENCER BINOCULARS — for detecting surface finish, imperfections, etc., by means of 3-dimensional vision. $143.50.

WILDER PROJECTOR provides accurate measuring or comparison of objects by means of magnified shadow.

GEORGE SCHERR COMPANY, INC. 130 LAFAYETTE ST., NEW YORK 13, N. Y.

Self Balancing Die Set

THE Leslie Self-Balancing Die Set, manufactured by the Leslie Welding Co. of Chicago, Ill., introduces a new principle of die alignment which eliminates all need for leader pins, "heels" or other aligning devices which interfere with the movement of stock or limit its size.

These die sets greatly increase the range of work that can be done on press brakes, makes practical and economical their use for many stamping and blanking operations on large-sized sheets or plates.

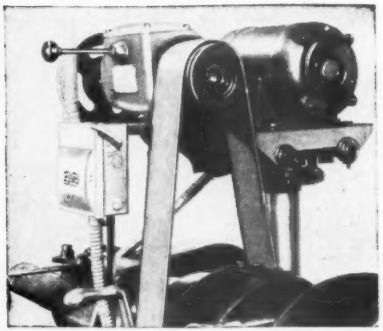
Leslie Die Sets are so constructed that even the largest and heaviest die sets may be assembled in the press brake without, in most cases, the need for a crane because no single part of the die set need be heavier than can be readily lifted by one or two men.

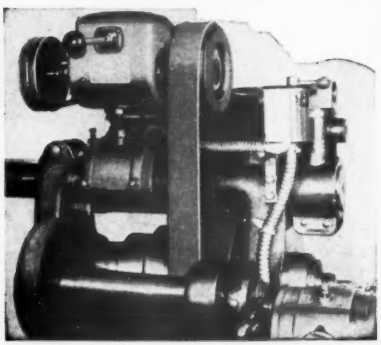
Another advantage of these die sets is that they can be assembled to give unlimited throat depth, hence permitting punching at great distances from all sides of large sheets and progressive operations through the press without rotating the sheet between each operation.

With the Leslie Self-Balancing Die Set it is very simple to remove or replace any punches, punch plates, dies and assemblies of dies just as easily while the die set is in the press brake as on the bench.

Leslie Welding Co., 2941 Carroll Ave., Chicago, Ill., will send Bulletin 9-43 giving details and specifications on request. 837-G

LATHES, MILLING MACHINES





shapers, turret lathes, radial drills, slotters, etc., are motorized with WESTERN MASTER (1-5 h.p.) Transmissions with bracket $95

WESTERN MAJOR (5-10 h. p.) Transmissions with bracket $145

and a WESTERN SUPER (up to 30 h. p.) for replacing gear boxes on large boring mills, radials, Ingersoll milling machines, etc.

We can also supply necessary V-belts, sheaves, output pulleys and motors from stock. Prompt deliveries on high Priorities.

◆

up to 30 h. p.
WESTERN TRANSMISSIONS

3400 SCOTTEN AVENUE DETROIT, MICHIGAN

A FREE TRIAL WILL SHOW YOU!

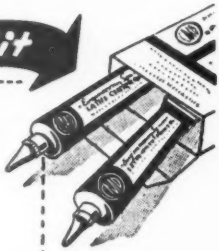
CMD CENTER POINT LUBRICANTS Protect Tools Better

Because CMD Center Point Lubricants can withstand pressures greater than 50,000 pounds per square inch, they provide maximum protection for lathe centers, grinder centers, gages, screw machine cams and quills and other precision built tool parts. Try CMD Center Point Lubricants on your toughest job and see for yourself. Mail the coupon for generous free samples now.

The center shown above is the famous *CMD Helical Groove Center* which has a left-hand helical groove that conveys the oil constantly to the extreme point of the center.

CMD CENTER POINT LUBRICANTS

Write for **FREE** *Sample Kit*



CHICAGO MANUFACTURING & DISTRIBUTING CO.
Dept. 1TJ, 1928 West 46th St., Chicago 9, Ill.

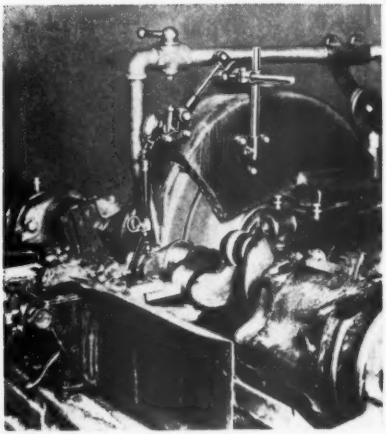
Without obligation please send us a free sample kit of one tube of CMD Center Point Oil and one tube of CMD Center Point Lube. Also send Catalog describing CMD Helical Groove Centers.

Mr. .....Position .....

Company .....

Address .....

City .....State .....



Diameter Grinding Control

THE Pratt grinding gage is useable on all makes of external grinders to provide the operator with a constant, visible check on the diameter of the work while the grinding operation is in progress. The gage is very sturdily built; all moving parts are hardened and ground and operate in bronze bearings. To assure accuracy and durability, the three points that contact the work and are responsible for the indicator reading are highly polished diamonds.

The actual operation of the gage involves no special skill on the part of the operator. Once the gage has been mounted and set to the desired size, the operator simply places it on the work as the grinding operation starts and when the indicator hand returns to zero, removes the gage and stops the operation. Through the use of the gage, scrap is eliminated and apprentice or semi-skilled operators are able to finish grind to a tolerance of .0001".

Standard model 9-D gage has been designed so that it can be used in measuring diameters from 5/16" to 27". This range is attained through the use of various "caliper frames" each having a range of 1" in itself.

American Diamond Tool & Gauge Co., 15918 Woodingham, Detroit, Mich., will send descriptive data. 572-G

*

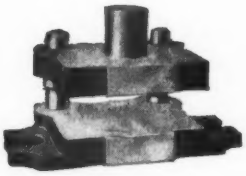
For continued excellence in the production of heat treating furnaces and equipment, the Lindberg Engineering Company of Chicago has been awarded a star for their Army-Navy "E" burgee.

BLOWS CUSHIONED with Rawhide HAMMERS and MALLETS

Coiled Rawhide faces strike effective blows without marring or battering; speed up work; reduce spoilage. Hold true faces—strike accurately. Outlast several ordinary mallets. Reduce bounce and recoil—prevent fatigue. All sizes with light or weighted heads. Write for Catalog.

Replacement insert faces for C/R Hammers sold by leading supply houses.

CHICAGO Rawhide MFG. CO.
1280 ELSTON AVE. ★ CHICAGO, ILLINOIS.



BETTER
DIE WORK
with Producto Master and Standard
INTERCHANGEABLE DIE SETS

Master sets for finest, most accurate die work. Pins and bushings are hardened, ground and lapped to very close limits. Standard sets for ordinary die work are fitted with hardened and ground steel pins and bushings. Steel and semi-steel.

SCREWS
IN STOCK FOR IMMEDIATE SHIPMENT

Write for free Illustrated Catalog.

All standard sizes of Socket Head Cap Screws and Hollow Set Screws CARRIED IN STOCK for your convenience. PLATING AND RUSTPROOFING: We can save you time by handling the rustproofing, plating or "parkerizing." Just include specifications on your order. We'll do the rest and bill you the usual extra charge.

We can fill your requirements for all Die Maker's supplies, including a complete line of Springs in three standard types, and the amazing Hardsteel Drills that enable you to drill hardened steel without annealing.

GET FREE CATALOG

DIE SUPPLY CO.
4751 HOUGH AVE., CLEVELAND, OHIO

☐ Send full story on Die Sets.
☐ Send information on Screws.

NAME_____

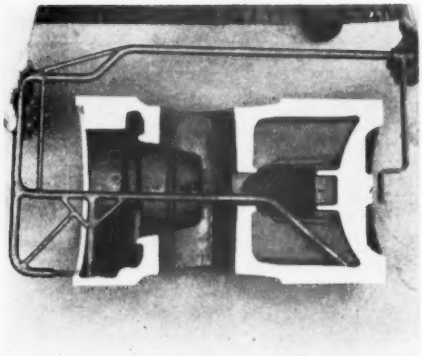
ADDRESS_____

CITY_____ STATE_____

DIE SUPPLY CO.

4751 Hough Ave. Cleveland, Ohio

Scribing Jig For Locating Piston Center



OVERCOMING the problem of turning engine pistons to uniform wall thickness is the function of a simple jig at The Cooper-Bessemer Corp., Mount Vernon, O.

This tool was constructed of pieces of tubing welded together as shown.

The end of the jig is inserted through the narrow opening at the bottom of the piston core so that it contacts the cored chamber wall.

To find the desired center the jig is "stepped" around the piston at arbitrary intervals. At each step or interval, and with the jig locating points contacting both the inside wall and the piston bottom, a line is scribed across the center area of the piston head by means of the scribing pin at the upper end of the jig. Two or more such center lines will, by their common point of intersection, locate a center concentric with the inner cylinder wall.

The lathe operator is thus able to save a considerable amount of machining time and produce a piston with uniform wall thickness so desirable in oil-cooled piston design.

This simple jig will be used in the production of all trunk pistons in The Cooper-Bessemer line of Diesel engines, gas engines and engine-driven compressors being produced for U. S. armed services.

For detailed information, write The Cooper-Bessemer Corp., Dept. J, Mount Vernon, O. 85-G

STRENES METAL IN FRONT LINE OF SERVICE

BEFORE THE WAR

Strenes can be cast to shape. Most of the usual machining time is saved. Redressing is reduced. That is why before the war Strenes gained heavily as a forming and drawing die metal. In one case around 2,000,000 stampings were obtained and the die is still in good condition ready to resume operation at the end of the war. Runs of 100,000 pieces up are not uncommon. Hundreds of the largest plants in the country used it regularly in their tooling programs. Want the names of pre-war users of Strenes?

IN THE WAR

Strenes today is being used for draw pots, draw pot inserts, draw rings for draw bench operation, for progressive upsetting dies . . . all in shell manufacture. Glad to identify all such users and many others.

AFTER THE WAR

After the war, refrigerator, stove, metal casket, grave vault, farm implement and other manufacturers will resume with Strenes metal forming and drawing dies. Many of the automobile, truck and tractor builders are extensive users, for body, fender and hood dies. Will name them to interested inquirer .

Look into the merits of Strenes metal . . . Try it, at least once.

The Advance Foundry Company
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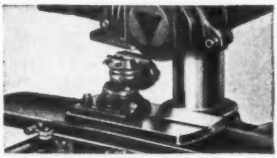
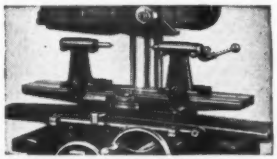


2. With the Univise . . it's a Chip-Breaker Grinder



3. With the Unihead . . it's a Tool & Cutter Grinder

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As a Tool & Cutter Grinder, it makes tool sharpening simpler, easier, cheaper, and extremely accurate. With the Unihead attachment, almost any conceivable angle can be ground.

Consult your Delta distributor or write for bulletins. M-8CC

Specifications

Wheels must have 1¼" hole.
Table surface 5¾ x 13".
Traverse feed, one graduation is .001".
Micrometer adjustment ⅜" range, each graduation is .0005"
Spindle speeds (with 60 cy. 1750 R.P.M. motor) 3200 and 4200 R.P.M.

No. 24-105 Surface Grinder.....$295.00
No. 24-205 Chip-Breaker Grinder 343.50
No. 24-305 Tool & Cutter Grinder 370.00

Priority required, A-1-A or better, under restrictions of Limitations Order L-237.

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Please send me your catalog and bulletins describing the Delta 3-in-1 grinder combination.

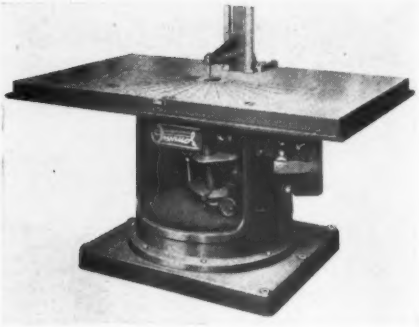
Name.....Position.....

Company.....

Address.....

City.....(.....) State.....

Onsrud Tilting Spindle Shaper



VERSATILITY and rapid flexibility have been added to the shaper principle by Onsrud by arranging spindle and drive motor for tilting forward or backward to any desired angle not exceeding 20°. Thus their A-69 accomplishes with relative ease many a job formerly looked upon as difficult and time consuming. Unlike the conventional shaper, it is claimed, this machine finds wide application in work of the single job variety because setup (if needed at all) is simple and rapid. Angle of the spindle is quickly set and locked, vertical position is adjusted with equal ease and if the guide pin is to be used, it is a simple matter to set the overarm bracket as desired.

Since the spindle tilts only forward or backward, it is obvious that work passed on the side of the cutter from back to front of the machine will always show a perpendicular cut regardless of the spindle angle. Work moved across the machine from right to left will show a bevel equal to the spindle angle. Work moved toward the cutter at some angle between these extremes will be beveled accordingly at a predetermined angle which can easily be altered simply by changing the angle of approach.

This feature permits easy duplication and matching of angles previously cut.

Onsrud Machine Works, Inc., 3932 Palmer St., Chicago 47, Ill. will send further details. 836-G

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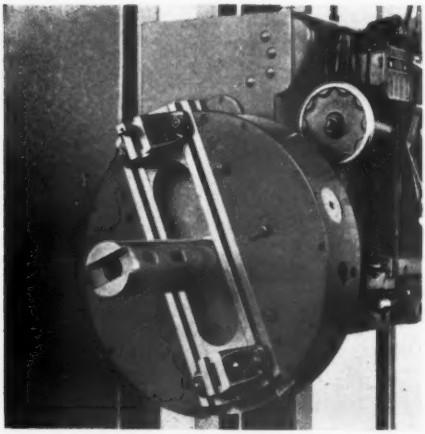

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A NEW, continuous feed, facing and boring head for Giddings & Lewis boring, drilling and milling machines has many unique features providing increased flexibility and simplicity of operation.

Features include: Six separate power feeds for the tool slide ranging in 0.041", 0.070" and 0.118" per revolution of the head; feed selector control for the selection of any of the above feeds; directional control provided by a lever pointing in the direction of feed to the tool slide, when head is rotating in normal direction (when head is used for boring or turning, this lever is set to the neutral position); micrometer adjustment for tool slide adjustment to 0.001"—one turn of the micrometer dial with hand crank moves tool slide ¼"; two facing tool holders, designed to accommodate ¾" square tool bits, are supplied as standard equipment.

Such operations as a facing operation using two tools for roughing; simultaneous facing and boring operations; and simultaneous turning and boring operations, are possible with this versatile boring head.

Giddings & Lewis Machine Tool Co., Dept. J, Fond du Lac, Wis., will send descriptive literature. 43-G

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Employees of the DeVilbiss Company, Toledo, Ohio, have recently won for the second time the Army-Navy Production Award for meritorious services on the production front.

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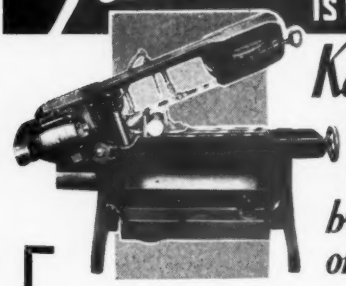

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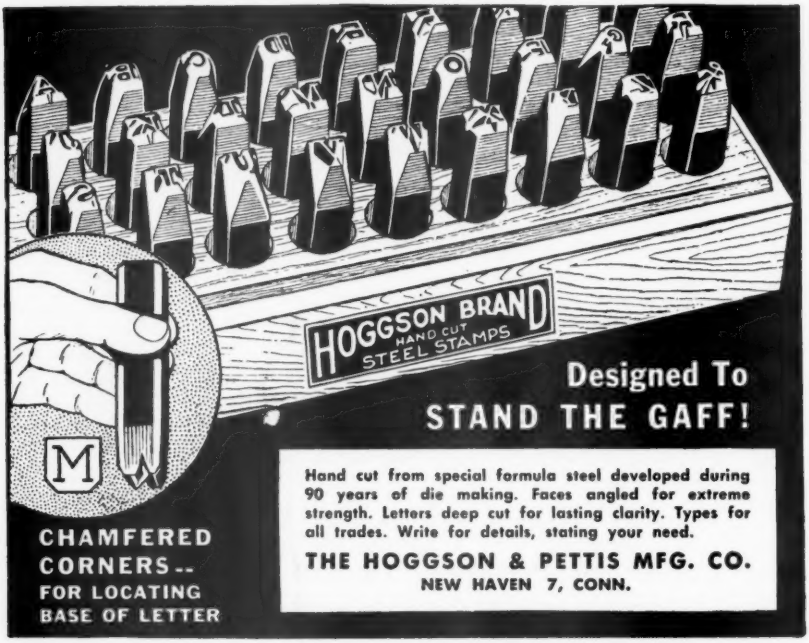

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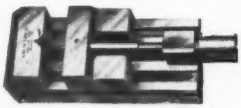

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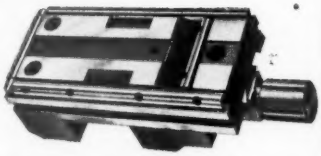

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and BOOK REVIEWS*

RADIOGRAPHIC INSPECTION OF METALS by Otto Zmeskal, Sc. D., formerly Assistant Professor of Metallurgy, Illinois Institute of Technology.

This is an introductory presentation of the principles and practices of radiography as they are utilized in the inspection of metals. It is designed for the practical radiographer and the inspector. It is an unusually practical textbook for courses in X-ray inspection. In one of the most important industrial fields today, this book is unique in that it presents the essentials of radiographic practice with a minimum of theoretical and technical background. It is directed to the practical radiographer and the inspector, men who have seldom had extensive training in physics, and who would find a detailed physical presentation of the subject of little practical value.

RADIOGRAPHIC INSPECTION OF METALS covers its subject thoroughly. Some theoretical aspects are included, but only because they must be understood for intelligent use of radiographic equipment, i. e., theory is presented whenever it is directly tied in with actual practice. An important feature of the volume is the illustrations. Many radiographs illustrate the various types of defects that may be encountered; diagrams illustrate good radiographic practice; photographs show typical modern equipment in use. Illuminating radiographs of welds are shown, and of castings in steel, iron, brass, aluminum, magnesium, and other metals. Many of the illustrations were furnished by prominent X-ray companies.

A full reference list provides the student who is interested in further study with carefully selected and up-to-date books and articles on many phases of radiography. A detailed glossary provides definitions of terms used in the text, and also elaborates some of them, such as circuit diagrams, curves showing film characteristics, and X-ray tubes. One of the appendixes provides complete descriptions of penetrometers specified by the various inspection groups.

Published by Harper & Brothers, 49 E. 33rd St., N. Y. 16, N. Y., and priced at $2.75.

STEEL PRODUCTS MANUAL. Standard packages for delivering steel mill products overseas in first-class condition under even the most severe conditions of wartime transportation have been designed by packaging experts of the steel industry. Culminating an intensive, three-year study of methods of preparing steel products for overseas shipment in wartime, a fully-illustrated, 180-page manual "Packaging, Marking & Loading Methods for Steel Products for Overseas Shipment" has just been issued by the Committee on Packaging, Loading and Shipping Problems of the American Iron and Steel Institute.

The manual contains instructions which have been approved by the Army Service Forces, the Navy Department and the U. S. Treasury, Procurement Division, for wrapping, tying, boxing, marking and loading various steel products. In preparing the instructions, many consultations were held with purchasing missions representing the British Empire, China, U. S. S. R., the Fighting French, Belgium, the Netherlands, Iceland and Turkey. The standard packages described and illustrated in the manual have been designed to protect steel products during shipment to any part of the world—from Iceland to Oceania. Very often when the steel is ready for shipment, no one in the mill knows its ultimate destination. For that reason it must be packaged in such a way that neither the extreme heat of the tropics nor northern sleet storms can damage it.

Published by The American Iron and Steel Institute, 350 Fifth Ave., N. Y. C., and priced at $2.50.

A Course in **BLUEPRINT** Reading, Checking, Testing, Parts I & II, by Otto A. Steinike, Department of Drawing, Beaver Dam

When purchasing books kindly address your order directly to the publisher.

High School, Beaver Dam, Wisconsin.

Part I, an instruction book on blueprint reading, and Part II, made up of 78 blueprints related to the text of Part I, constitute a course of study in the field of drawing and the various trades which require blueprints or drawings as a means of interpreting the work to be done. This is the first of three objectives the author had in view when preparing his material.

The second objective of the course is to develop the students' skill in reading mechanical and machine drawings in schools which are not equipped to teach drawing and shop courses.

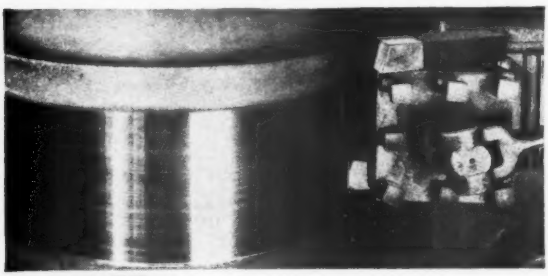
The third objective of this course is to provide a general guide in blueprint reading for the adult, in the field of mechanics, trades, and industries, who does not seek the rudiments of mechanical and machine drawing but who desires to learn how to interpret practical drawings into workable ideas. He will develop a sense of individual thinking and will be able to solve drawing questions which arise when new assignments or jobs are presented. The ability to adapt himself to new work will result in a wider knowledge of related information in his chosen vocation.

Published by McKnight & McKnight of Bloomington, Ill., and priced at $1.20 for Part I and 80¢ for Part II.

SPUR GEARING by W. M. Owen, Training Supervisor, Caterpillar Tractor Co.

To many people—even in the metal working industries—the subject of gearing appears to be a difficult and somewhat mysterious subject. The author's objective, most successfully attained in this book, is to deal with a few of the theoretical points in a simple manner as a basis for understanding gears. It is true that there are many very technical phases in gearing and gear manufacture upon which volumes have been written. However, a good working knowledge can readily be obtained by anyone with a little understanding of mathematics and mechanical drawing and a willingness to study. Gearing is really a very interesting subject.

Perhaps the first thing a student runs onto in his study of gearing is a lot of mysterious sounding names and formulas, many do's and don'ts, and a few standards. Indicative of the author's success in leading the reader over these hurdles is his statement that if the student will approach this gearing problem with a good understanding of screw threads and study the way in which they are used and can be applied, it will help in attaining a parallel understanding of gearing. For instance: It is possible to thread a 1" round rod with any profile of thread and any pitch; however, there is only one widely used thread profile for this particular size of shaft. Likewise in gears many accurate profiles of teeth can be developed for a given pair of



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• Output by turrets, engine lathes, pipe threading machines, cutting off machines, drill presses, and other types of chucking machines, is greatly increased by the use of Thomas - Barker Wrenchless Chucks and Vises.

A pull on the lever grips the piece part with great power—a push on the lever releases the part. For many parts made on turrets, engine lathes, etc., it is unnecessary to stop the machine to set the work. The cycle of operation is simple and fast—reducing machine waiting time to the minimum.

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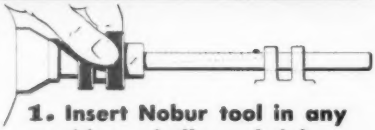
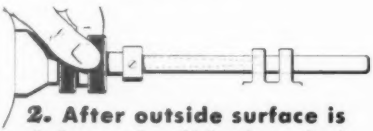
How to deburr holes faster!

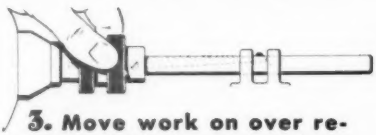


1. Insert Nobur tool in any machine spindle and deburr outside surface of work.

Works like a drill—operator works with complete safety—parts can be burred as fast as they can be handled by operator.



2. After outside surface is deburred, slide knurled sleeve back to retract blade.



3. Move work on over retracted blade and deburr inside surface.

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gears, and here again there are but few profiles that are widely used.

In spite of the author's direct and simple approach to a highly involved art, the comprehensiveness of his treatment may be appreciated by a listing of the chapter subjects: Friction Wheels and Development; The Two Systems of Gearing, Cycloidal, Involute; Gear Tooth Nomenclature; Proportions of Gear Teeth (Formulas); Backlash Calculations and Considerations; Checking Gears; Common Standard Gear Systems, 14½° Involute, The 14½° Composite System (Range Cutters), 20° Involute, 20° Stub, Fellows Stub; Long and Short Addendum Involute Gears; Problems (and Answers) in Gear Calculating.

Published by McKnight & McKnight, Bloomington, Ill., and priced at 72¢.

PLASTICS by J. H. DuBois, B. S., Plastics Dept., General Electric Co., 1943 2nd and revised edition.

This book conveys basic and useful knowledge concerning the plastics, their history, origin and raw material sources; their physical, chemical and electrical properties and their limitations; methods of their fabrication and essential information concerning their design. The plastics designer must be able to plan the construction of his products so that they become simple assemblies of plastics, metal stampings, die castings and screw machine parts. He must be informed enough to take advantage of the best properties that each material can contribute, and create a product, at minimum cost, which is pleasing in appearance and high in quality. The author has kept continuously in mind the thought that a working knowledge of plastics is of fundamental importance to those engineers and designers who want to make the best use of their talents today by making the fullest use of these "materials of tomorrow."

After preliminary study, this book is intended to serve as a reference handbook, to be consulted whenever a new product is to be designed, or when manufacturing problems or material shortages call for changes in product design. In using the book as a reference handbook, the following suggestions will be found helpful. A review of Chapter XIII will indicate the materials which should be used. The material selected should be reviewed in the chapters which outline its properties and the methods of fabrication. A study of Chapter XII on finishing and decorating the plastics materials will serve as a guide to the things which must be considered in the actual product design. Chapter XIV contains the fundamental details of mechanical and elec-

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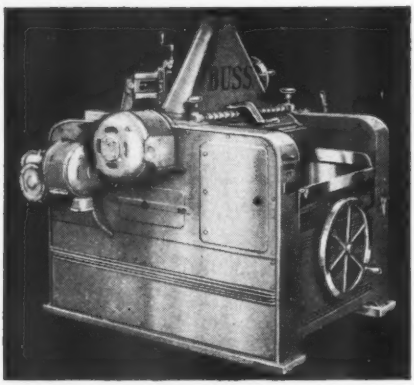

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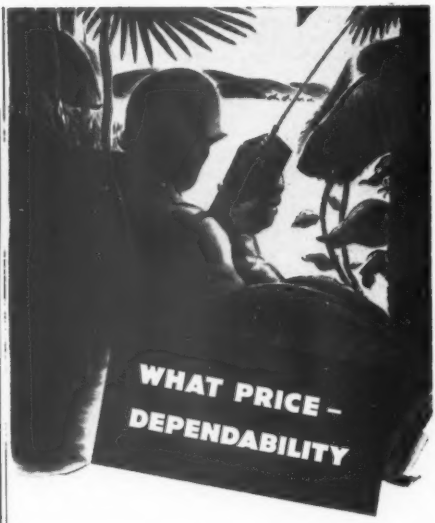

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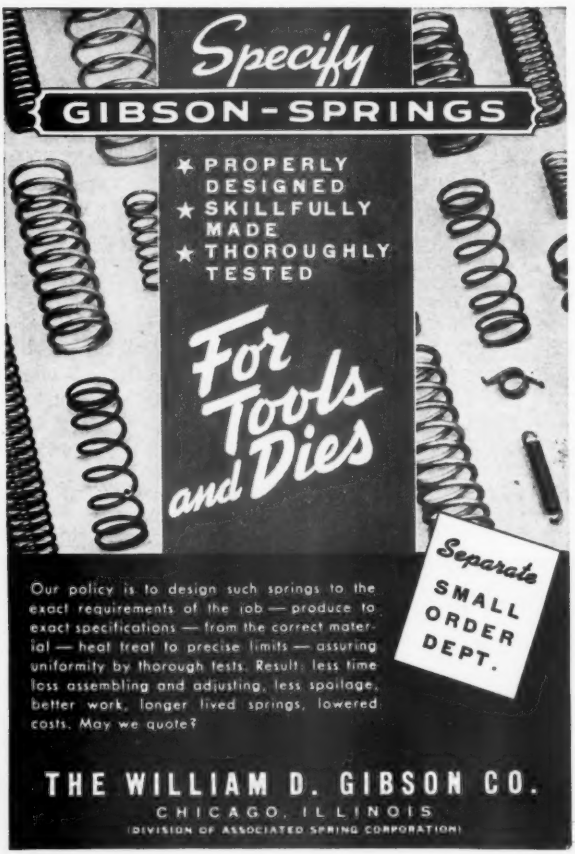
trical design which must be observed to obtain quality products at low cost and with a minimum of manufactured problems. All of this practical information has been gathered during the fourteen years in which the author has been engaged in the engineering and design of products to be manufactured from every type of plastics material. His work has brought him into close contact with many industrial designers and engineers, giving him basic understanding of their problems, and particularly of the difficulty they have encountered in obtaining practical and adequate design information on the ever-increasing flood of new plastics materials.

Published by The American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill., and priced at $3.75.

STUDIES IN ARC WELDING Design, Manufacture and Construction. The trustees of The James F. Lincoln Arc Welding Foundation have now made available, in book form, a 1296-page volume of 98 outstanding papers in the 1940-42 Progress Program which they believe are an important contribution to the literature of welding. The papers, consisting of 1287 pages and 1007 illustrative photographs and drawings, are of particular significance in that they cover a period during which the process of welding has been marked by pronounced advancements. In the 98 papers selected, most of which are published in full, general useful and informative data is given dealing with design, fabrication and construction. Some include stress and loading calculations and estimates of material and welding costs. These comprehensive studies contributed greatly to the nation's production efforts both before and after we entered the war and are the work of engineers, designers, officials of production and other authorities in specialized fields of construction. This volume of experiences represents a basis for sound economic rehabilitation after the war. These papers are dedicated to the scientific progress of arc welding and are published for the first time in book form so that members of the engineering profession, designers, architects and production men in many fields of endeavor may have up-to-date reference data that will further their knowledge of modern welding practice and procedures.

The book is of convenient desk size, 6 x 9 inches, printed on a good grade of paper and bound in semi-flexible leather. It will be sent anywhere in the U. S. A. for $1.50 postpaid; $2.00 elsewhere. The James F. Lincoln Arc Welding Foundation, P. O. Box 5728, Cleveland 1, Ohio.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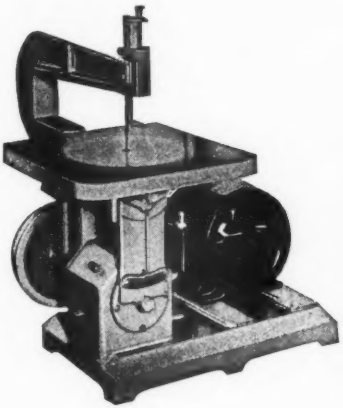

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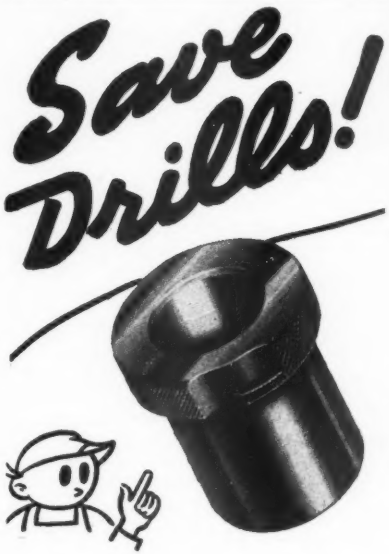

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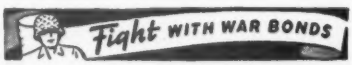

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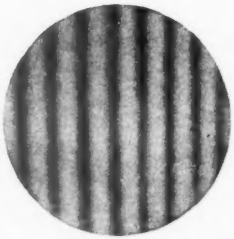

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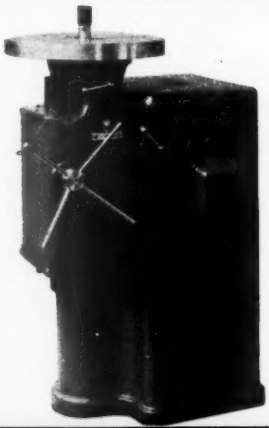

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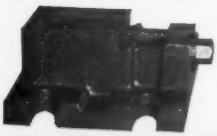

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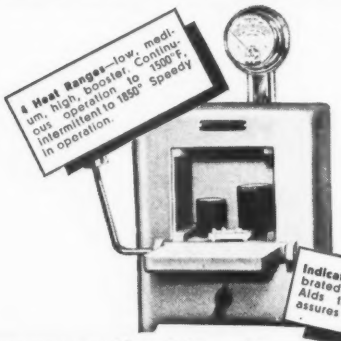
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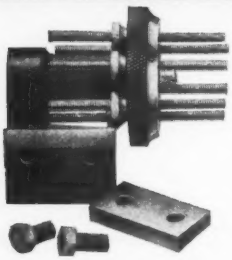

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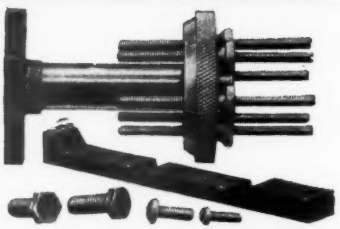

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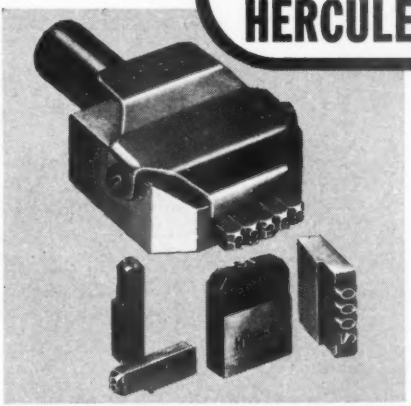

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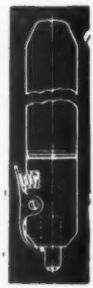

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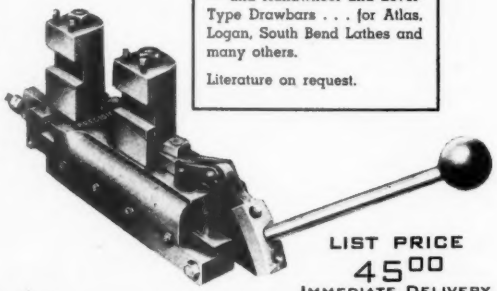

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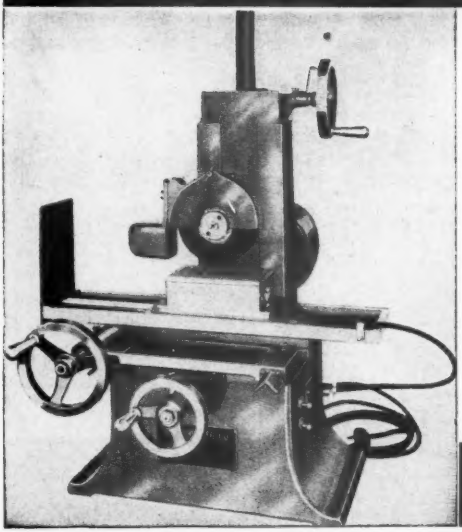

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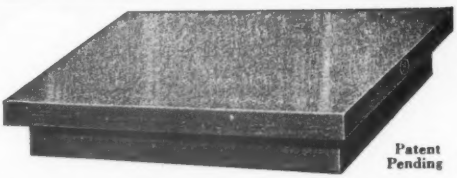

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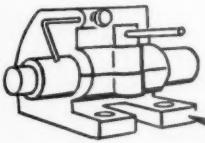

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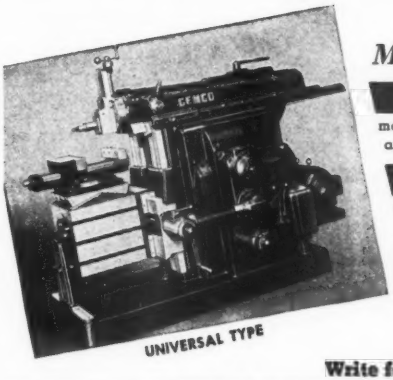

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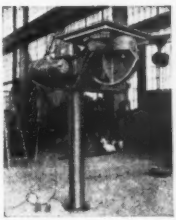

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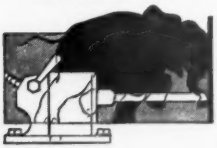

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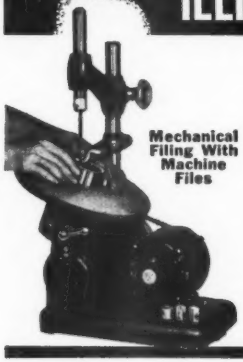

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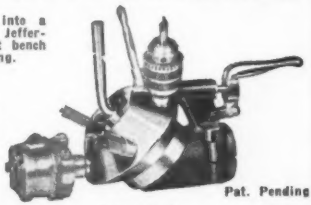
Photo above shows Jefferson Turrets on 16″ Lathe

CONVERT your engine lathe into a Turret Lathe in 15 seconds, with Jefferson Turret Attachments. To fit bench lathes and lathes up to 24″ swing.

This new modern Tail-stock turret (right) made in 4 sizes to fit small bench lathes and lathes up to 24″ swing. Also the adjustable Pull-Feed lever (not illustrated).



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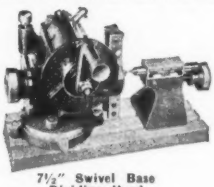
5-Tool Tail-Stock Turret

Then there's the completely modernized Tool-Post Turret (right, below) made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.



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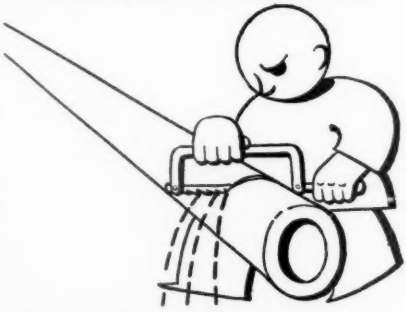

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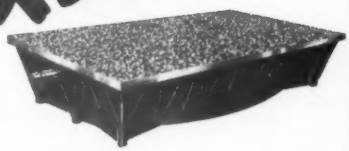

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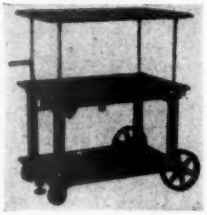

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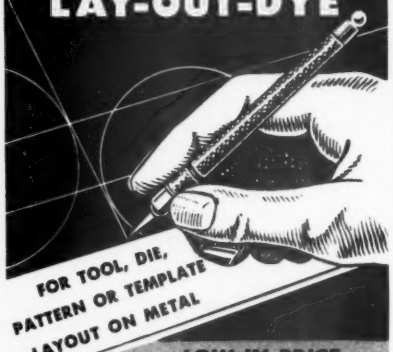

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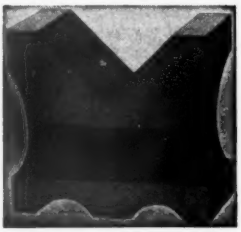

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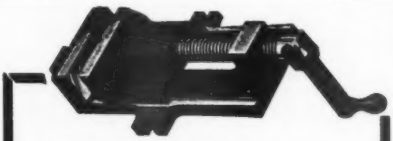

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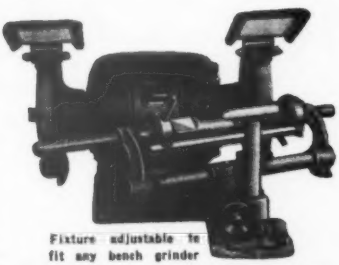

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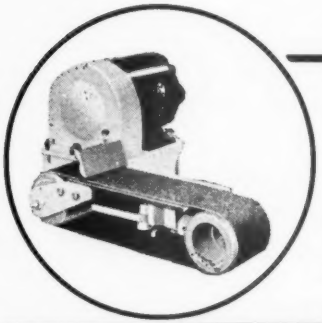

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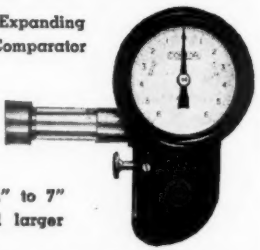

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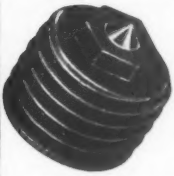

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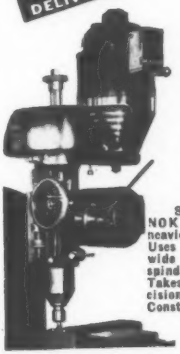

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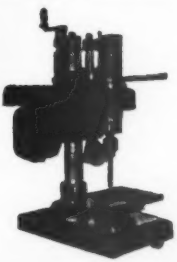

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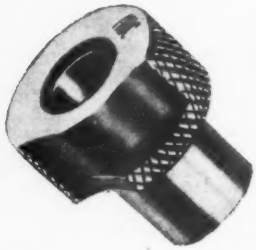

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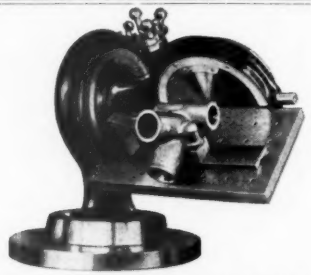

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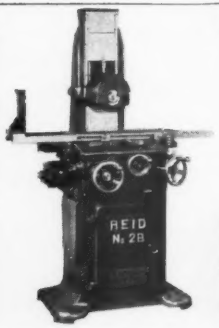

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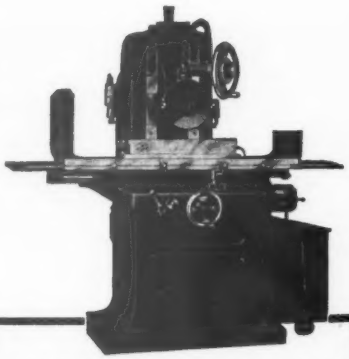

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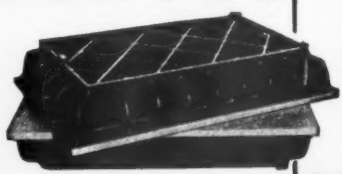

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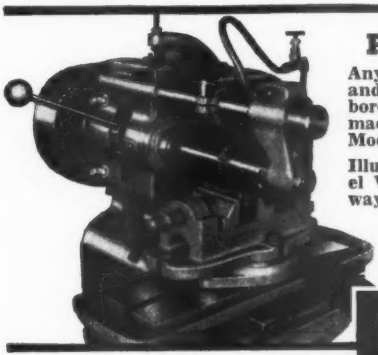

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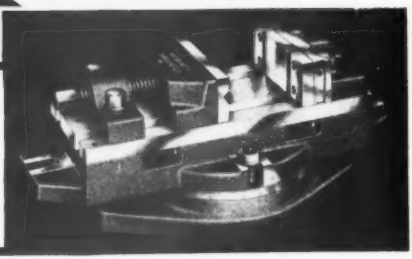

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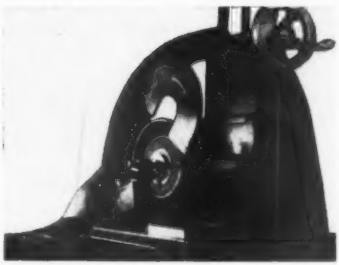

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National Association of Cutting Tool Manufacturers

FORMATION of a National Association of Cutting Tool Manufacturers has been assured by the practically unanimous vote of 150 representatives of some 100 manufacturers of cutting tools. These representatives functioned as "temporary members" pending the formation of the association proper.

In announcing plans for a National Association of all metal-cutting tool producers assurance was given that there will be no repetition of Detroit's recent "Tool Scandal" and "black market" if the Nation's manufacturers of cutting tools can help it.

When the news broke that two million dollars worth of "surplus" government-owned unused cutting tools—many of them allegedly of "standard" types—had been sold in Detroit at scrap prices and many then resold by dealers at reportedly fabulous profits, a number of cutting tool manufacturers were in Washington at a meeting called for another purpose by the War Production Board.

These manufacturers were asked by governmental officials to prepare plans to assist in preventing possible future sales as "scrap" of usable surplus war equipment. A number of informal meetings of individual manufacturers have been held since that time and out of these meetings already has come some valuable assistance to the WPB by individual companies.

It was quickly recognized however, that for really effective solution of the problem of controlling and disposing of war surpluses through cooperation with governmental agencies as well as the solution of other vital problems affecting the industry, broad cooperation and participation was required on the part of the hundreds of concerns who are actually members of the cutting tool manufacturing industry.

According to one large local tool manufacturer, the Detroit "scandal" probably never would have occurred if there had been in existence a central organization similar to the Automotive Council for War Production representing the industry with which various governmental agencies could discuss their problems.

A temporary nine-member Board of Directors has been elected with W. G. Robbins, Carboloy Company, Inc., as Chairman. The other members of the temporary Board are: Oscar L. Bard, President, Michigan Tool Company; George L. Buffington, Ex-Cell-O Corporation; E. A. Goddard, Vice President, Goddard and Goddard Company; Norman Lawton, Partner, Star Cutter Company; R. G. Michell, President, Eclipse Counterbore Co.; E. C. Putnam, President, Putnam Tool Company; R. M. Severance, President, Severance Industries, Inc. and R. H. Wolfe, President, Arrow Tool and Reamer Company.

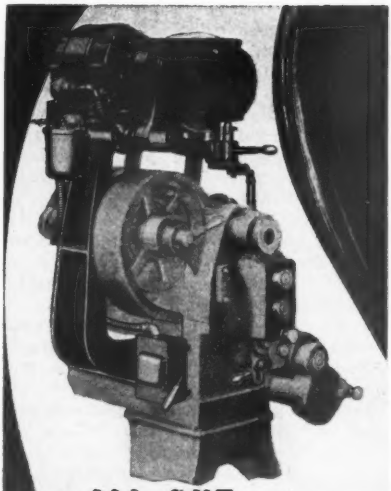
Decision to form the Association on a national basis was voted as a result of considerations of the many National objectives of such an association and the expressed desire of tool companies outside the state of Michigan to take part in its activities.

The temporary board is charged with the responsibility of developing by-laws and formulating definite plans of organization, membership qualifications, etc., of the new Association, based to a considerable extent on the objectives initially discussed.

Among these are assistance to not only the cutting tool industry but also Federal and local agencies on such subjects as renegotiation, taxes, contract cancellation and termination, disposal of surplus cutting tools by the Armed services, standardization of cutting tools to permit greater simplification of production equipment and methods, problems arising from cancellation, etc., of pool orders and post-war disposal of emergency manufacturing facilities.

An important decision was that the Association should have nothing to do with anything pertaining to either prices or marketing of tools. An exception to the latter is cooperative assistance to

(TO PAGE 198—PLEASE)



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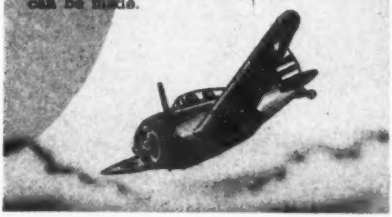

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(CONTINUED FROM PAGE 196)

the armed services in simplifying disposal of surplus war equipment.

In this connection, a general summary of the plan formulated by the Army Air Corps to make possible disposal of surplus tools without dumping or scrapping was given the meeting. Details of the plan were withheld by the Air Corps awaiting final approval of the plan.

With regard to contract cancellation, it was pointed out that tool manufacturers usually are sub-sub-sub-contractors and frequently have to hold up production for months on end, at present, without being able to obtain financial settlement on the part of the contract already completed.

In addition to providing the mechanics of assuring more orderly disposal or redistribution of surplus war materiel, the Association is also scheduled to discuss other problems which affect industry today and will affect it tomorrow.

One of the most important of these is the possibility of the standardization and classification of metal-cutting tools to reduce manufacturing costs in industry through simplification. Another is the vital service which the industry can render the Nation by providing the first reliable source for short-term forecasts as to probable future industrial activity and employment since declines or increases in industrial activity are always preceded by declines or increases in the overall demand for cutting tools.

No decision was reached as to whether —on completion of by-laws—these be submitted to the possible membership by mail for vote or by calling a National meeting of all cutting tool manufacturers. It was definitely decided however that all producers of cutting tools should be given an opportunity to become members from the outset, regardless of location within the United States.

★

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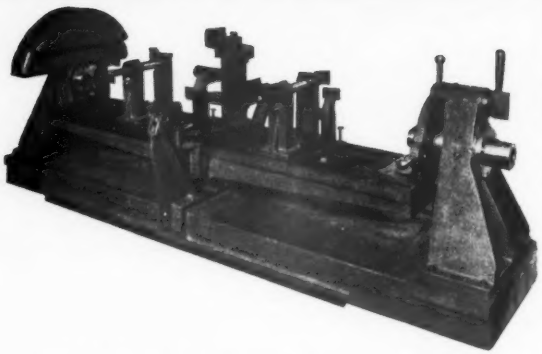

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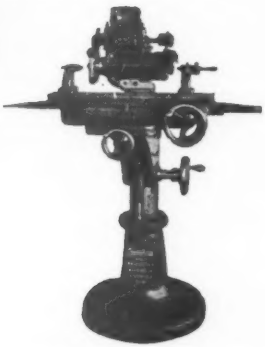

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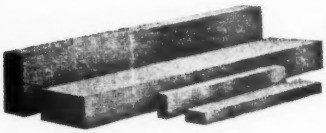

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⅜	½	6	3.50	13/16	1¼	12	7.75
⅜	⅝	6	3.50	1	1¼	12	8.00
⅜	¾	6	3.50	1	1½	12	8.50
½	⅝	6	4.00	1	2	12	9.50
½	¾	6	4.00	1¼	1½	12	9.00
½	1	6	4.00	1¼	1¾	12	9.50
½	⅝	9	5.00	1¼	2	12	10.50
½	¾	9	5.00	1¼	2½	12	12.00
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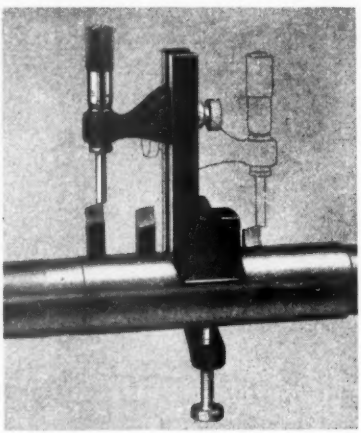

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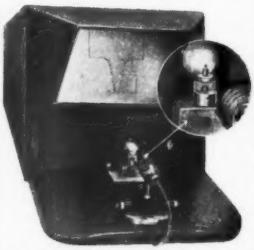

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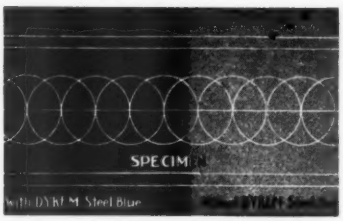

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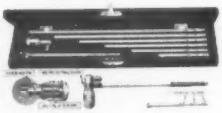

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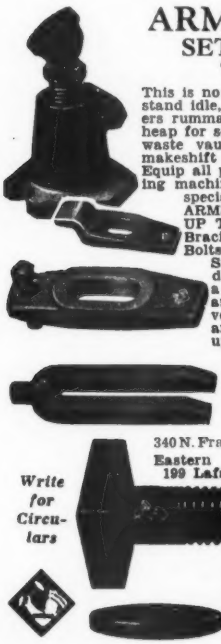

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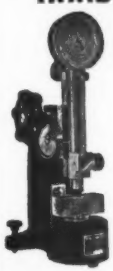
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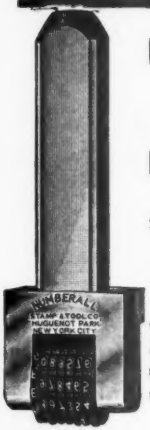

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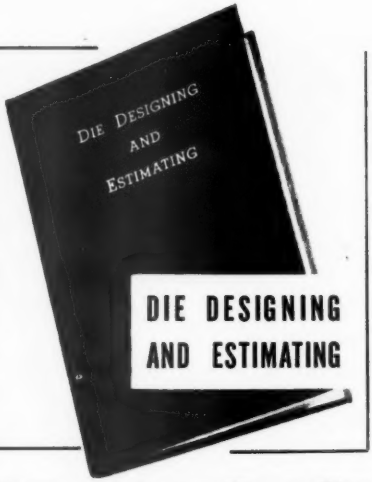

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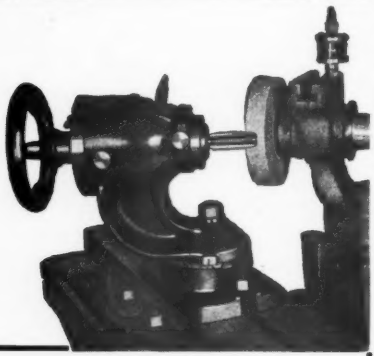

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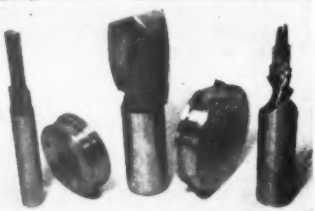

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War Manpower Commission Inventory of Apprentice-Training Programs

THAT there has been an enormous expansion in training programs during 1943 to keep abreast of the ever-present demand for new workers in the nation's war production plants is revealed in the annual inventories of apprenticeship and short-term training systems just completed by Apprentice-Training Service, Bureau of Training, War Manpower Commission. These inventories show the increase of both these types of training programs by industry and trade in each State for the twelve months ending November 1943, and the name and location of each company which has adopted one or both of these programs.

During this period, fully 3,300 additional plants have adopted one or both of these types of systems with the assistance of field representatives of Apprentice-Training Service. These 3,300 plants are in addition to the 28,000 other plants and establishments which had similar programs in operation prior to November 1942.

At least 1100 of these 3,300 additional plants have set up short-term programs under which thousands of new recruits have been trained for work of limited skill on the production line; and at least 2,200 plants have adopted apprenticeship programs under which additional thousands of apprentices are being trained for all-round skilled work.

There are two different kinds of apprenticeship systems in operation—area-wide systems and individual plant systems. An area-wide apprenticeship system covers on an average as many as 30 employers in a city, county or larger area; while individual plant apprentice training systems are designed to train apprentices employed by only one company. On the other hand, short-term programs are, with almost no exception, established on an individual plant basis.

The number of apprenticeship programs, including area-wide and individual company systems in all industries—manufacturing, construction and miscellaneous—has increased over 23 percent during the year ending November 1943; and short-term systems have increased 650 percent.

The transportation industry shows the greatest increase in short-term systems established with the assistance of Apprentice-Training Service. Starting at scratch in November 1942, 461 of these systems have now been put into operation.

The increase of training programs established in each individual State has depended, of course, upon the manpower requirements and the size of the war contracts awarded, and also upon the extent of training programs previously established; but it has also depended to a very large extent upon the kind of war equipment manufactured. In mass production plants where the product is made up of a number of parts each of which can be standardized, it is possible to break down the operations and parcel out the work to a large force of semi-skilled workers. For these semi-skilled jobs workers can be trained rapidly by short-term training methods. In other plants where standardization of parts and division of labor is not possible, a large proportion of the force must be all-round men and this requires apprentice training.

The expansion of training activities shown in these inventories, reflects to a large extent the industrial growth during the war not only in the big industrial States but in States—especially in the South—which have, until recent years, been primarily agricultural, such as Georgia, Kentucky, South Carolina, Virginia and West Virginia. In Hawaii, too, there has been a great increase since the attack on Pearl Harbor of apprenticeship programs now in operation.

A copy of these statistical inventories may be obtained by writing to Apprentice-Training Service, Bureau of Training, War Manpower Commission, Washington, D. C.

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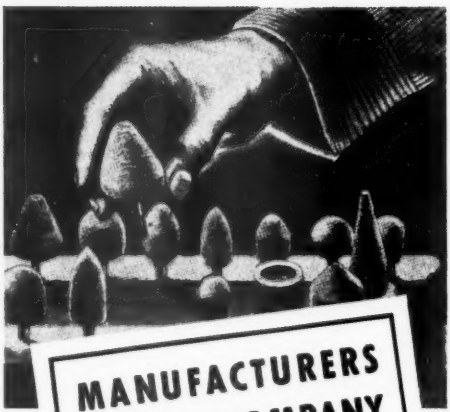

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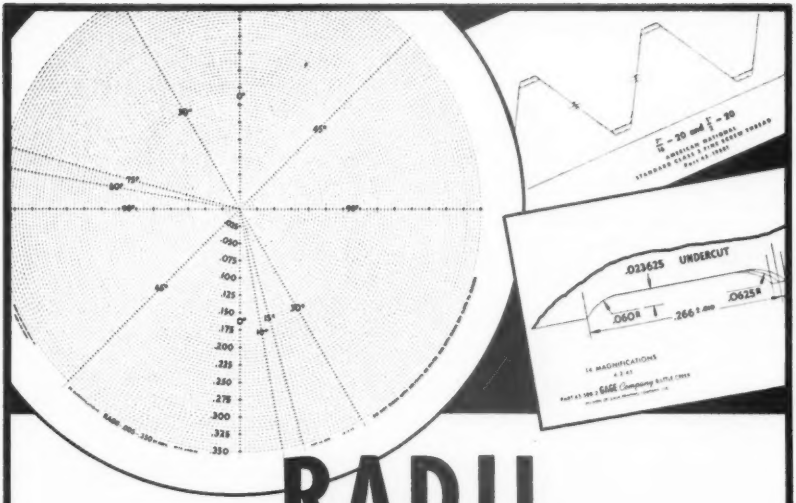

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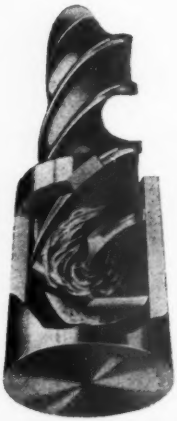

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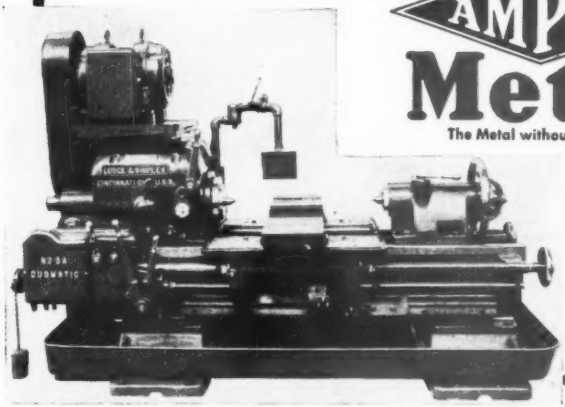

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Do you know about the new Treasury Department quotas for the current Pay-Roll Allotment Drive? *Quotas running about 50% above the former figures?* You see, these new quotas are based on the fact that the armed forces need more money than ever to win the war, while the average worker has more money than ever before to spend. Particularly so, on a *family income* basis—since in so many families several members are working, now.

Remember, the bond charts of today are the sales curves of tomorrow! Not only will these War Bonds implement our victory—they'll guard against inflation, and they'll furnish billions of dollars of purchasing power to help American business re-establish itself in the markets of peace.

So get this new family income plan working at once. Your local War Finance Committee will give you all the details of the new plan. Act today!

This advertisement prepared under the auspices of the War Advertising Council and the U. S. Treasury Department.

LET'S KEEP ON Backing the Attack!

This Space is a Contribution to America's All-Out War Effort by

THE TOOL & DIE JOURNAL Staff

FEDERAL

Taperlock

PLASTIC GAGE HANDLES

MADE of light weight plastic material, Federal Gage Handles are lighter than any metal used, even one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue in long continued use; an advantage appreciated by women inspectors.

They are highly satisfactory with glass gages; being so much lighter than metal handles, they reduce the danger of chipping and breakage.

Insulating properties help prevent transmission of bodily heat to gages which may affect accuracy.

Marking for identification is accomplished with the same marking tools used for metal gages.

Immediate Delivery

SEVEN SIZES AND COLORS

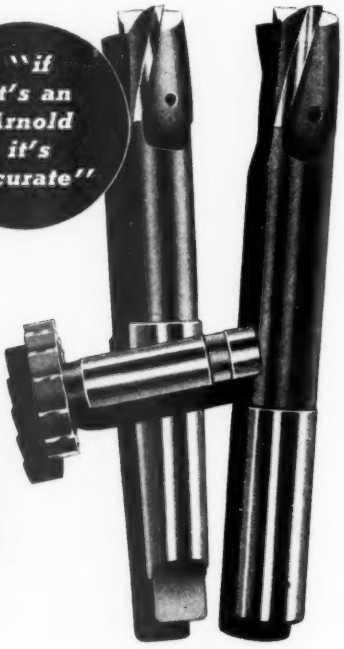
00, 0, 1, 2, 3, 4, & 5—in Red, Green, Yellow, Black

FEDERAL TOOL CORPORATION

400 NORTH LEAVITT ST., CHICAGO, ILL.

Quick Delivery OF QUALITY CUTTING TOOLS

"if it's an Arnold it's accurate"



Many of America's leading manufacturers have learned that most of the quality cutting tools listed in the new Arnold catalog can reach them surprisingly fast. For instance, three types on which you can expect almost immediate delivery are illustrated above. They are: counterbores, straight and taper shank with interchangeable pilots and Woodruff key seat cutters. Arnold's thirty years of toolmaking experience can provide you with cutting tools that can be depended upon for maximum efficiency, service and accuracy. If you do not have our new 40 page catalog containing the complete Arnold line, send for it at once. No obligation.

ARNOLD
Tool Company
14469 EUCLID AVE.
EAST CLEVELAND 12, OHIO

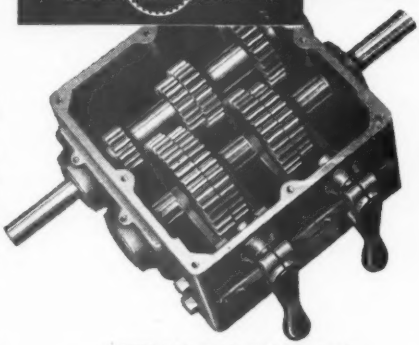
TRIPLE THREAT PRODUCTION STAR

1 No belts to shift. Drives to large step of cone at all speeds.

2 Eliminates overhead line and counter shafts.

3 All advantages of geared head with belt drive smoothness.

TURNER
UNI-DRIVE
Motorizes Machine Tools

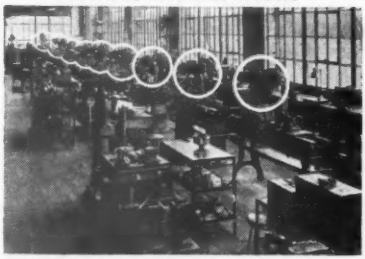


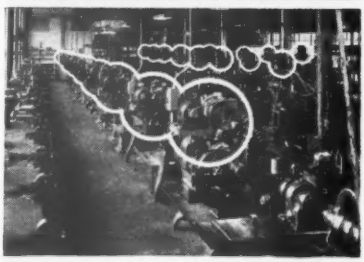
● It's helping to bring schedules through on time in hundreds of plants. Increases production capacity 25% to 300%. Saves time. Slashes costs. For lathes, shapers, milling machines, turret lathes, radial drills, boring mills, hobbing machines, Browne & Sharpe and Cleveland Automatic Screw Machines and other tools. See your dealer . . . or write for details.

Outstanding Performance for These Users:

American Brake Shoe & F. Company
Kellogg Division
Southern Wheel Division
Augusta Arsenal
Bendix Aviation Corp.
Brown-Lipe-Chapin Div. General Motors
Cessna Aircraft Corp.
Chicago, Rock Island & Pacific R. R. Co.
Chicago Screw Company
Delco-Remy Co. Div. General Motors
Doehler Die Casting Co.
Electric Auto-Lite Co.
Frankfort Arsenal
Frisco Lines
Holtzer-Cabot Elect. Co.
Imperial Brass Mfg. Co.
International Projector Co.
Kohler Corp.
Monsanto Chemical Co.
The New York Air Brake Company
Ohio Pattern and Fdry. Co.
Oneida, Ltd.
Parker Appliance Co.
Republic Steel Corporation
Revere Copper and Brass, Incorporated
SKF Industries
The Timken-Detroit Axle Company
The Todd Company
Wagner Electric Co.
W. A. Shaeffer Pen Co.

TYPICAL INSTALLATIONS





The TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
3416 Terrace St. **Kansas City, Mo.**

NOW AT WORK FOR VICTORY ★★★

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

By the Army, the Marines, and the Navy, too.

SHELDON Precision Lathes have been selected by the Army for its Mobile Machine-Shop Units, by the Marine Corps for its trailerized shops and by the Navy as the ideal lathes for several types of repair shops aboard ship and ashore.

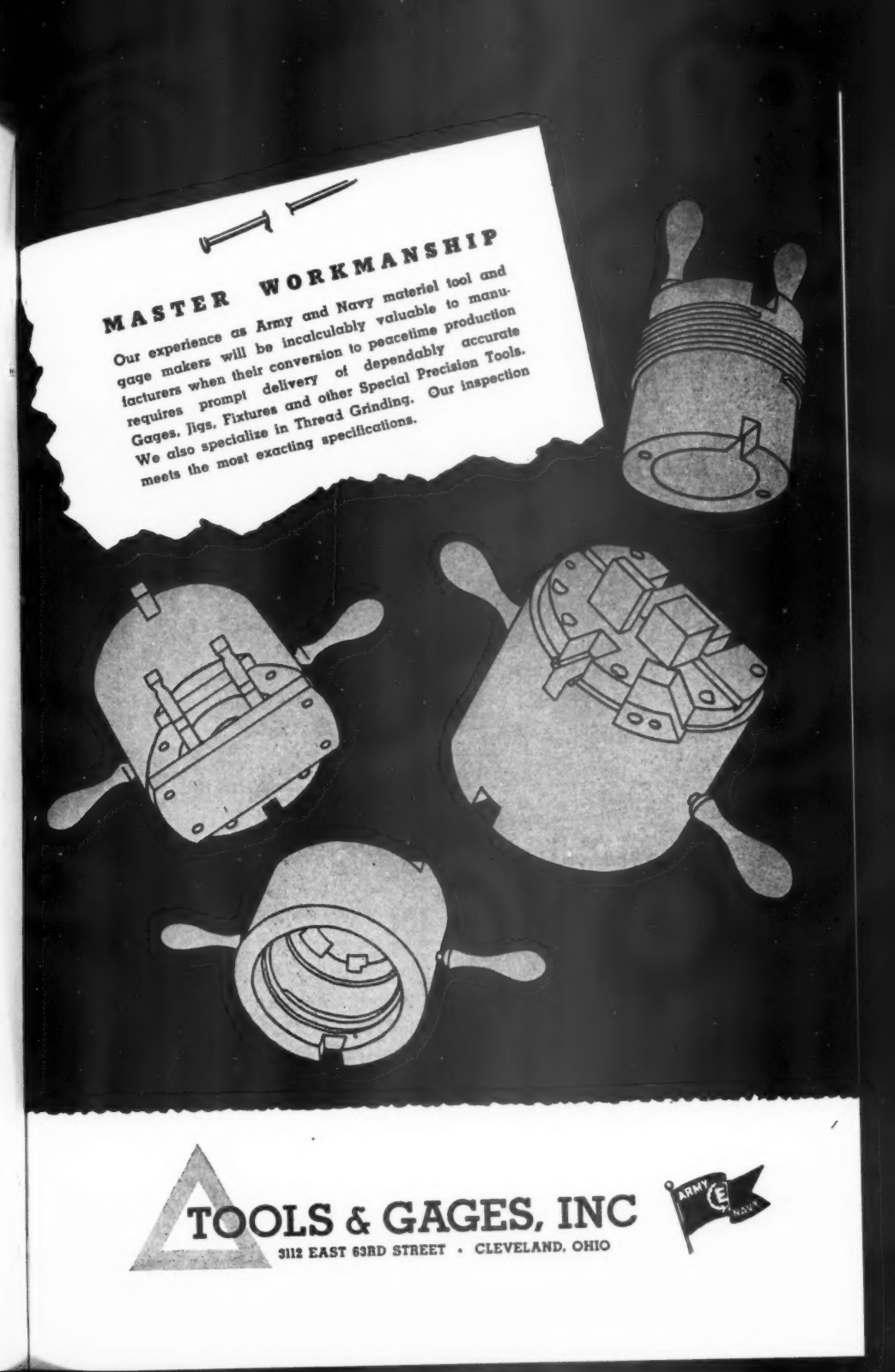
SHELDON Lathes are also widely used in British, Canadian, South African, Russian and other allied factories to speed the production and maintenance of war material . . . proof of worldwide SHELDON accuracy and dependability.

SHELDON 10" (1-inch collet capacity) Precision Lathe and Bench Unit with E-type underneath motor drive.

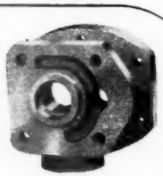
SHELDON

SHELDON MACHINE CO., INC.

4236 N. Knox Ave. Chicago 21, U. S. A.


MASTER WORKMANSHIP
Our experience as Army and Navy materiel tool and gage makers will be incalculably valuable to manufacturers when their conversion to peacetime production requires prompt delivery of dependably accurate Gages, Jigs, Fixtures and other Special Precision Tools. We also specialize in Thread Grinding. Our inspection meets the most exacting specifications.
TOOLS & GAGES, INC
3112 EAST 63RD STREET • CLEVELAND, OHIO
ARMY
E
NAVY

TO MASS PRODUCE PARTS LIKE THESE...



Turn to Turchan

THE ALL-HYDRAULIC DUPLICATOR

THE *forte* of Turchan Followers is high speed production of parts like those pictured here. Any part of irregular or eccentric shape or contour — any part that normally requires time-killing and painstaking hours on a machine tool *can be produced with a Turchan-equipped machine tool from three to twenty times faster*

Turchan-equipped machine tools do not require highly skilled operators — no matter how intricate the machining job on hand may be. Any fair machine hand can handle one efficiently.

Turchan Followers attach easily to any standard lathe, shaper, grinder, planer or mill. Furthermore, they can be quickly disengaged whenever direct machining is desired. That's why many production men are *Turning to Turchan,* for faster, more efficient output. *Send for our new, free booklet on Turchan Followers today.*

TURN TO *Turchan* FOLLOWER MACHINE CO.

Originators of Hydraulic Duplicating Attachments

8253 Livernois Avenue Detroit 4, Michigan

PRECISION PARTS FOR PRECISION WEAPONS

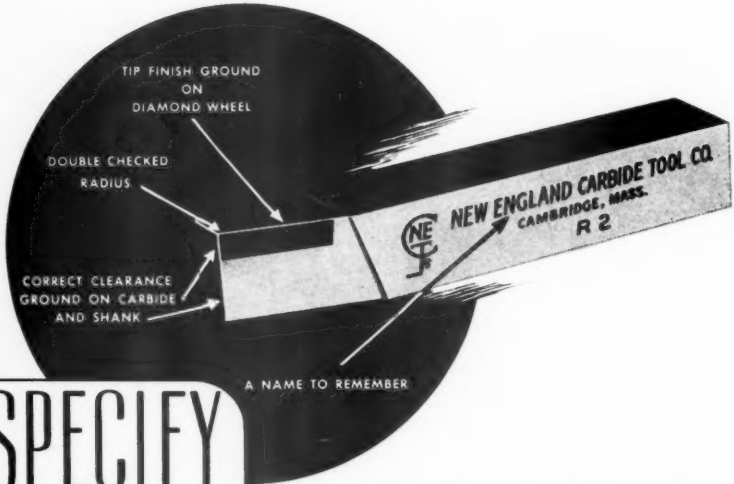
THE ACHIEVEMENT OF ALL THREE

C. M. Smillie Company has made precision production known by a new comprehensive standard — All Three! With All Three — skilled men — work supervision — modern equipment — C. M. Smillie Company has made possible the better control of tooling, grinding, and machining in fine precision work. Today — it is precision parts for precision weapons. Tomorrow — C. M. Smillie Company will continue to serve industry with this same All Three Standard of precision production.

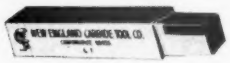
C. M. SMILLIE & CO.

1108 WOODWARD HGTS., FERNDALE, MICH.

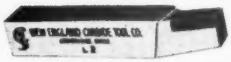
PRECISION ◆ YESTERDAY ◆ TODAY ◆ TOMORROW


TIP FINISH GROUND ON DIAMOND WHEEL
DOUBLE CHECKED RADIUS
CORRECT CLEARANCE GROUND ON CARBIDE AND SHANK
A NAME TO REMEMBER
NEW ENGLAND CARBIDE TOOL CO.
CAMBRIDGE, MASS.
R 2

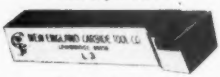
SPECIFY NEW ENGLAND *Standard* CARBIDE TOOLS



Tool Style No. 1

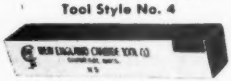


Tool Style No. 2

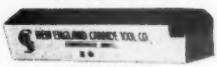


Tool Style No. 3

Tool Style No. 4



Tool Style No. X5



Tool Style No. X6

Styles 1 to 4 furnished right- or left-hand

New England *Standard* Carbide Tools are precision built—every tool is ready for the job, because correct radii and clearances are finish ground to correct tolerances. *Standard* tools are supplied with "U" grade tips for cutting aluminum, cast iron, brass, bronze and non-metallics, and in "S" grade for steel.

We will be pleased to arrange delivery schedules to produce your standard or special tools with any make or grade of carbide specified by you.

NEW ENGLAND CARBIDE TOOL CO.

60 Brookline Street • Cambridge, Massachusetts

TUNGSTEN CARBIDE PRODUCTS ◆ DIAMOND TOOLS ◆ DIAMOND POWDER

Please send me your new Standard tool folder and a Standard tool wall chart for our tool room. **TDJ**

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

ADVERTISERS INDEX

Abrasive Machine Tool Co..... 6
Accurate Bushing Co..... 192
Acme Industrial Company..... 172
Acme Tool Company..... 200
Acromark Co., The..... 175
Adamas Carbide Corp..... 205
Adroit Mfg. Co., Inc..... 202
Advance Foundry Co. 154
Advance Plating Co., The..... 17
Aget-Detroit Mfg. Co..... 20
Ajax Steel & Forge Co..... 170
Allegheny Ludlum Steel Corp.... 31
Alofs Mfg. Co..... 202
American Cutter & Engineering Corp. 190
American Industrial Publishers . 201
American Photocopy Equipment Co. 171
Ames Co., B. C..... 142
Ampco Metal, Inc..... 215
Angle Computor Co..... 192
Armstrong-Blum Mfg. Co..... 228
Armstrong Bros. Tool Co..... 203
Arnold Tool Co..... 218
Ash & Company..... 213
Atlas Equipment Co..... 169
Autometric Corp. 66
Automotive Maintenance Machinery Co. 52

Baker Brothers, Inc..... 172
Bartelt Engineering Co..... 200
Barth Stamping & Machine Works 186
Bellows Co., The..... 33
Binswanger & Company..... 60
Bissett Steel Co..... 184
Black Drill Company..... 35
Boggis & Company, Henry P.... 206
Boyar-Schultz Corp..... 212
Brand Tool & Supply Co..... 203
Builders Iron Foundry..... 160
Bunell Machine & Tool Co.....70, 71
Burke Machine & Tool Co..... 201
Busch Company, J. C..... 186
Buss Machine Works..... 166

Carborundum Company, The..... 36
Cerro de Pasco Copper Corp..... 187
Chicago Mfg. & Distributing Co. 151
Chicago Rawhide Mfg. Co..... 152
Chicago Wheel & Mfg. Co..... 23
Cincinnati Grinders, Inc..... 68
Cincinnati Milling Machine Co., The 69
Cincinnati Shaper Co., The..... 47
Cleveland Tool Engineering Co... 64
Cleveland Twist Drill Co..... 76
Cleveland Universal Jig Company 207
Colonial Broach Company..... 28
Colonial Bushings, Inc..... 193
Columbia Tool Steel Co..... 193
Comtor Company 190
Conrad & Moser..... 207
Cooley Electric Mfg. Co..... 54
Cooper-Bessemer Corp. 113
Cratex Mfg. Co..... 205
Crobalt, Inc. 164
Cullen-Friestedt Co. 179
Cullman Wheel Company..... 197
Cunningham Co., M. E..... 191

Danly Machine Specialties, Inc. 61
Davis Tool & Engineering Co... 207
Dayton Rogers Mfg. Co..... 194
Dearborn Gage Company..... 10
Delta Mfg. Co..... 155
Denning Mfg. Co..... 207
Detroit Reamer & Tool Co..... 214
Detroit Stamping Co..... 144
DeVlieg Company 143
Diamond Tool Co..... 202
Die Supply Company..... 153
Di-Machine Corp. 134
Dix Mfg. Co..... 204
DoAll Co., The..... 182
Domestic Industries, Inc..... 30
Douglas Machinery Co..... 55
Dreis & Krump Mfg. Co..... 207
Dresel-Betz Co. 207
Dumore Company 51
Dykem Company 202

Ecstern Etching & Mfg. Company 72
Economy Engineering Co..... 59
Electrix Corporation 156
Enterprise Machine Parts Corp.. 9
Erickson Steel Company 4, 5
Ex-Cell-O Corp. 38

Federal Foundry Supply Company 189
Federal Tool Corp..... 217
Firth-Sterling Steel Co.....27, 40
Fisher Tool Co..... 186
Fonda Gage Company..... 18
Ford Mfg. Co., M. A..... 53
Forging & Casting Corp., The.. 2

Gage Company 211
Gairing Tool Co., The..... 29
Gallmeyer & Livingston Co..... 193
Galter Mfg. Co..... 182
General Die-Stamping-Tool Co. 44, 176
General Die & Tool Company... 207
General Engineering & Mfg. Co. 179
Gibson Co., William D..... 168
Gilron Products Co..... 226
Golconda Diamond Products Corp. 195
Gorton Machine Co., George..... 19
Gottscho, Inc., Adolph..... 205
Grobet File Co. of America..180, 189

Hamilton Tool Co.....188, 191
Handy & Harman..... 32
Hardinge Brothers, Inc..... 3
Hartford Special Machinery Co., The 190
Heimann Mfg. Co..... 191
Herman Stone Co..... 177
Hill-Clarke Machinery Co..... 183
Hoggson & Pettis Mfg. Co., The 162
Holo-Krome Screw Corp., The... 74
Hovis Screwlock Co..... 157
Hypro Tool Co..... 167

Ideal Tool & Die Co., Inc..... 182
Illinois Tool Works..... 181
Industrial Machine Co..... 207
Industrial Products Suppliers.... 205

J & R Specialties Co..... 205
J & S Tool Company..... 185
Jefferson Machine Tool Company. 181
Johnson Gas Appliance Company. 173

Kalamazoo Tank & Silo Co..... 160
Kearney & Trecker Corp..... 37
Kiffer Tool & Die Co..... 207
King Products 188
Kold-Hold Mfg. Co..... 167

Lakeside Steel Improvement Co., The 158
Lapointe Machine Tool Co..... 25
Latrobe Electric Steel Co..... 141
Leach Machinery Co., H..... 192
Lee Co., K. 148
Lempco Products, Inc..... 11
Lima Electric Motor Co., The... 39
Linderme Machine & Tool Co., Inc. 146
Logan Engineering Company..... 73
Lorain Machine & Tool Co..... 207
Lucas & Son, Inc., J. L..... 204
Lufkin Rule Co., The..... 203

M-B Products 186
Majestic Tool & Mfg. Co..... 175
Manufacturers Supply Co..... 210
Masonite Corp. 43
Master Gauge Co.....178, 199
Master Machine & Tool Co..... 198
Matthews Co., Jas. H..... 136
McDonough Mfg. Co..... 194
McKinney Tool & Mfg. Co..... 48
Mead Specialties, Inc..... 180
Melin Mills 24
Mercury Metal Die & Letter Co. 147
Meyers Company, W. F..... 21
Michigan Chrome & Chemical Co. 188
Minn-Kota Mfg. Co..... 189
Moore Special Tool Co..... 49
Motor Tool Mfg. Co..... 45
Muehlhausen Spring Corp..... 46

National Tool & Die Manufacturers Association 116
National Twist Drill & Tool Co. 34
New England Caride Tool Co.... 224
Noble & Stanton, Inc..... 207
Nobur Mfg. Co..... 165
Norton Company 159
Numberall Stamp & Tool Co..... 206

Oliver Instrument Company..... 185
Oliver Motorcraft Corp..... 188
O'Neil-Irwin Company 14

Paramount Tool Co..... 207
Peerless Machine Co..... 41
Penrod & Sons Tool & Engineering Co., Floyd 170
Perfex Gage & Tool Co..... 137
Phoenix Machine Co..... 8
Pipe Machinery Co., The..... 207
Procunier Safety Chuck Co..... 22
Production Machine Co..... 63
Producto Machine Co., The..... 199
Putnam Tool Co..... 195

Rane Tool Company, The..... 1
Robbins Engineering Co..... 207
Roberts Rubber Co., Weldon..... 145
Rockford Die & Tool Works, Inc. 140
Royal Oak Tool & Machine Co.. 207
Rusnok Tool Works..... 191
Ruthman Machinery Co..... 204

Sanford Mfg. Co..... 176
Sav-Way Industries 26
Schauer Machine Co..... 183
Scherr Co., Inc., George..... 149
Schraner & Co., A. P..... 207
Schultz & Anderson Co..... 174
Severance Tool Industries..... 8
Sheldon Machine Co., Inc..... 220
Shore Instrument & Mfg. Co., Inc., The 205
Skilsaw, Inc. 133
Smillie & Company, C. M..... 223
Smit & Sons, Inc., J. K..... 197
Smith Tool & Engineering Co... 187
Sommer & Adams Co., The..... 227
Sossner 161, 177
South Bend Lathe Works..... 62
Springfield Machine Tool Co..... 12
Standard Pressed Steel Co..... 169
Star Machine & Tool Co..... 207
State Manufacturing & Construction Co. 16
Sunnen Products Co..... 135
Swedish Gage Co. of America... 178

T & H Manufacturing Co..... 207
Tamms Silica Co..... 206
Tannewitz Works, The..... 58
Taylor Machine Co., The..... 207
Thermo Electric Mfg. Co..... 174
Thomas Hoist Co..... 165
Timken Roller Bearing Co..... 13
Tomkins-Johnson Co., The 7
Tool Engineering Service Co., Inc. 194
Tools & Gages, Inc..... 221
Toolthrift Co. 207
Tungsten Electric Corp..... 42
Turchan Follower Machine Co... 222
Turner Gauge Grinder Co..... 15
Turner Machinery Co..... 219

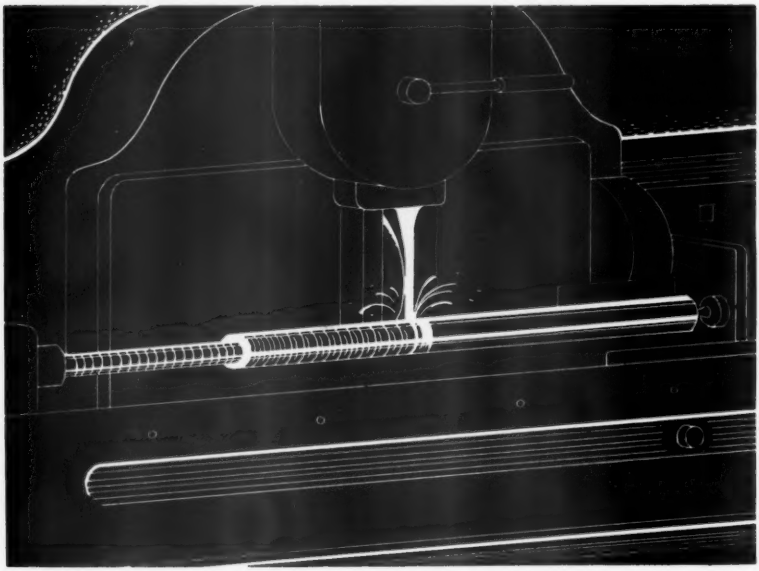
United States Treasury..... 216
Universal Engineering Co. 171, 173, 184
U. S. Machine Tool Mfg. Corp. 205

Vard, Inc. 209
Variety Machine & Stamping Co. 207
Viking Tool & Mach. Corp..... 207

Walker-Turner Corp. 130
Walls Sales Corp.....190, 193
Welding Equipment & Supply Co. 139
Wells Mfg. Corp..... 67
Western Mfg. Co..... 150
Wheelock, Lovejoy & Co., Inc... 192
Whistler & Sons, Inc., S. B..... 57
Wilson, K. R..... 50
Wilson Mechanical Instrument Co., Inc. 187
Wittek Mfg. Co..... 58

Yoder Co., The..... 65
Yost Mfg. Co..... 189

Zagar Tool, Inc..... 188



GILRON THREAD GRINDING COOLANTS ARE TAILOR MADE!

Aircraft parts, standard and special gages and a myriad of precision specialties to fill our war needs require thread grinding operations.

Gilron engineers have developed an oil (coolant) to materially increase production speed and output of inspector-approved work.

As a tailor-made product it is adjusted to meet the working conditions of each plant according to material ground, finish, grinder and desired speed and feed.

A convincing list of satisfied users testifies to the value of this *new* Gilron development. It will pay you to investigate. Write for data unit T.

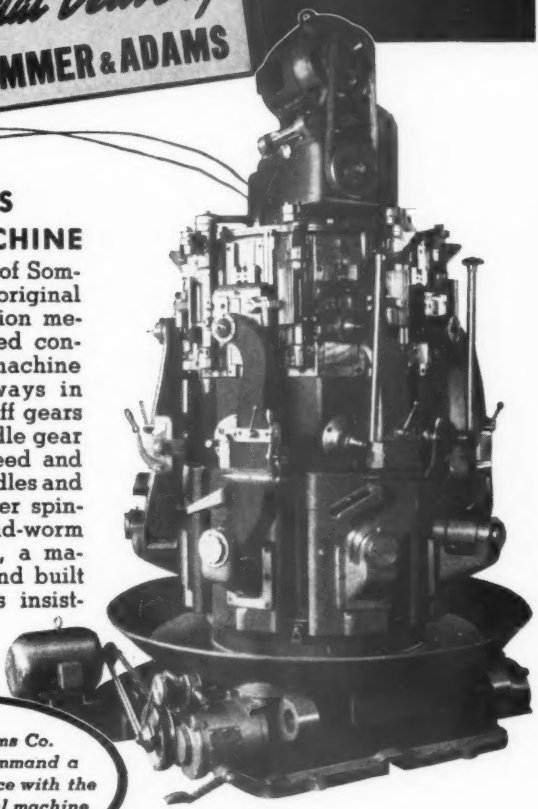
Gilron PRODUCTS COMPANY

1557 EAST 40th STREET
CLEVELAND, OHIO

SCIENTIFIC COOLANTS
DRAWING-GRINDING-CUTTING

Another PRODUCTION INCREASER

Special Delivery FROM SOMMER & ADAMS



8-STATION CONTINUOUS MILLING MACHINE

Another example of Sommer & Adam's original design—an 8-station mechanically operated continuous milling machine for milling keyways in axle shafts. Pick-off gears in index and spindle gear boxes change speed and feed of cutter spindles and turret index. Cutter spindles are worm-and-worm driven. All in all, a machine designed and built to answer today's insistent call for production *with accuracy.*

The Sommer & Adams Co. places at your command a 25-year acquaintance with the intricacies of special machine design and construction.

THE SOMMER & ADAMS COMPANY

18511 EUCLID AVENUE • CLEVELAND, OHIO

Custom-Built EQUIPMENT FOR MANY PURPOSES

Cut anything that will go between the jaws

This is one of five No. 18 MARVEL Giant Hydraulic Hack Saws used by a well known Texas tool company to "cut-off" multiple bars of alloy steels in round, square, and flat shapes, up to the maximum capacity of the large work-throat (18" x 18").

These super hack saws are designed for the largest sizes, and toughest steels—up to 18" x 18". After a year's heavy duty service, when asked as to the effectiveness of these saws in solving the cutting-off problems at this plant, the mechanical engineer in charge reported them "very effective."

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave., Chicago, U. S. A.
Eastern Sales Office: 225 Lafayette Street - New York

★ ★